RAILROAD GAZETTE

FRIDAY, DECEMBER 4, 1896.

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Contributions.

Relative Steam-Making Capacity of Firebox and Tube Surface.

BOSTON, Mass., Oct. 22, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In an interesting editorial in the last issue of the *Railroad Gazette* [Oct. 16] on the results of Professor Goss locomotive tests, the statement is made that "each square foot of direct heating surface exposed to the fire will do more work than 10 sq. ft. average of the indirect heating surface, which is mainly made up of the interior of the tubes." Some months ago I commented upon a similar statement made in your editorial columns, and stated that I did not consider this true in any important sense. I think it would interest the readers of the *Railroad Gazette* if you would explain how you know this to be a fact. F. W. DEAN.

[Another reader has asked how our statement can be reconciled with the results obtained by M. Docteur on the Belgian State Railroads with his brick firebox. These results were published in the *Revue Industrielle* and other European papers, and an American contemporary thinks they show that a square foot of firebox heating surface is of no more value in making steam than a square foot of average tube heating surface. The Docteur firebox has firebrick sides and back. The crown-sheet and tube-sheet remain as direct heating surface as in the common type of locomotive boiler. To reduce the loss of heating surface the number of tubes was increased to 306. It was found that after plugging 76 of these tubes, steam pressure could not be maintained in regular service, but as many as 76 could be plugged and steam kept up by forcing. The heating surface before plugging the 76 tubes was 16 sq. ft. in firebox and 1,707 sq. ft. in the tubes; total, 1,723 sq. ft. After the plugging, the tube heating surface was reduced to 1,285 sq. ft., and the total to 1,301. The argument offered is that because this heating surface is the same as that of some other locomotive on the Belgian State Railroads with 1,300 sq. ft. heating serface, of which 122 sq. ft. is in the firebox, "we are therefore at liberty to conclude that the difference in the production of steam between the direct and indirect heating surfaces is very slight in a locomotive boiler." In the same article great stress is laid on the value of the better combustion claimed for the brick firebox and for the perfect air mixture for the gases, but no allowance is made for these large claims in the deductions about direct and indirect heating surfaces. In fact, the writer seems to have drawn two conclusions from the same set of data by suppressing a different part of the data in each case so as to fit the theory. It is like solving for two unknown quantities with only one equation. It is easy enough if one doesn't mind the facts involved. Our contemporary concludes that "it seems to have been demonstrated that an evaporative efficiency equal to the present firebox can be obtained with the brick-lined arrangement." Concerning all this we say a few words on the editorial pages.—EDITOR RAILROAD GAZETTE.]

Bulk Rates and Big Cars.

Chicago, Milwaukee & St. Paul Railway,
MILWAUKEE, Nov. 25, 1896.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The discussion of the large-car problem in your recent issues shows the consensus of opinion to be that tariffs upon light and bulky articles must be based upon measurement and not upon weight to meet existing conditions; but apparently no one has gone into the practical details of such a radical change in tariff making. I therefore beg leave to suggest the following plan as one which can be made effective to the satisfaction of the transportation companies without objection from the shippers.

Assuming the cubic contents of the largest box cars available for general service of this kind between the seaboard and Chicago (for instance) to be 3,000 cu. ft., let all lines engaged in the traffic issue the following:

Special tariff per cubic foot upon articles taking minimum carload weights less than 24,000 lbs. under the Official Classification.

When minimum rate per carload is	Rate per cubic foot will be
$60 (÷ 3000 =)	2.000 cts.
61	2.033
62	2.067
63	2.100
64	2.133
65	2.167
...	...
70	2.333
...	...
78	2.600
etc.	etc.

This tariff to apply only when cars furnished cannot be loaded to the classification minimum, and charges thereunder must be based upon the *maximum capacity in cubic feet of the car loaded*, whether the entire space be occupied or not.

The application of this tariff would be as follows:

The present minimum carload rates between New York and Chicago are:

Wooden ware, 20,000 lbs. at 30c. per cwt.	$60
Wool, 10,000 lbs. at 65c. per cwt.	65
Vehicles, 20,000 lbs. at 35c. per cwt.	70
Furniture, 12,000 lbs. at 65c. per cwt.	78

Therefore if such shipments were tendered any line unable to furnish a car of the maximum cubic capacity (3,000 ft.) it would supply the largest cars on hand and charge on wooden ware, wool, vehicles or furniture, 2, 2.167, 2.333, or 2.6 cts. per cubic foot respectively, computing the charges upon the total capacity of the cars actually loaded.

In like manner all articles of this class would be charged on the basis of the actual space provided by the carrier for the shipment; there would be no discrimination between shippers; and the line with the largest cars would have the least possible advantage therefrom.

This would, of course, necessitate the marking of cars with their cubic as well as weight capacity ultimately; but it is worthy of note that until all cars are so marked, any man with average intelligence and a rule can readily determine their capacities.

The adoption of the plan herein sketched in out line necessitates no changes in either rates or minimum weights, but would assist greatly in securing the maximum of service from cars of all sizes and in reducing to a minimum the inducements for the continued building of box cars of excessive dimensions. That it is not a final solution of even the traffic side of the problem is fully appreciated. E. D. SEWALL,

Ass't Gen'l Freight Agent, etc.

Very Fast Running.

15 *Abercromby Place,*
EDINBURGH, Oct. 17.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We in Scotland have been flattering ourselves that we held the record for the fastest daily, scheduled, start-to-stop run on earth in the shape of the two runs by the Caledonian Railway with West Coast expresses from Perth to Forfar, 32½ miles, in 32 minutes.

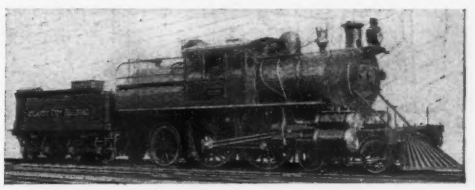
But a correspondent, "S. M. V.," in your issue of Sept. 11, calls attention to the 4 p. m. schedule of the Reading Royal Route train to Atlantic City, and shows its schedule working, station to station, to vary from 68.86 to 74.44 miles an hour. But is this *start-to-stop* timing or only passing timing? for it makes all the difference.

As the matter is of both historical and international importance perhaps you would kindly settle the point by printing a complete table showing in columns the miles, names of stations and starting and stopping times of the schedule, adding a brief account of the locomotive (cylinders, drivers, firebox area, heating surface, weight, etc.), and above all the weights of the coaches and Pullmans which ordinarily form the train, in pounds. If you can you might append a record of some of her best runs.

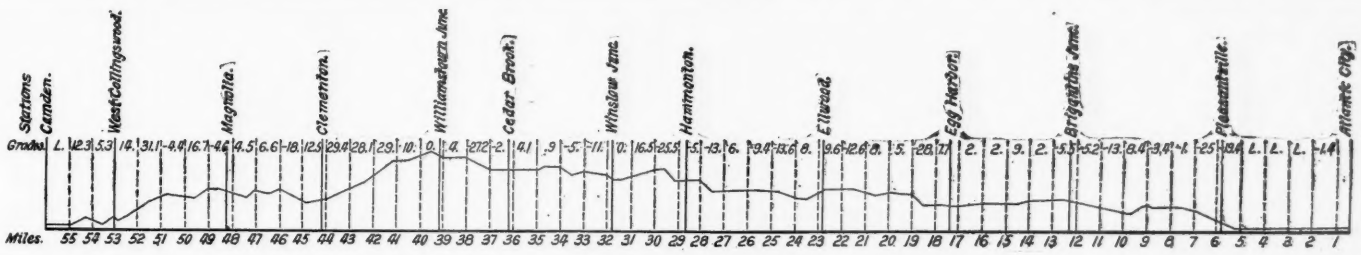
I may say that the Caledonian run from Perth to Forfar is generally done under time, and sometimes in 29 minutes, and also that the Caledonian nearly every morning run the West Coast express from Carlisle to Sterling, 118 miles, in 118 minutes, start to stop, and have frequently done it in times like 117, 115 and 114 minutes over mountain gradients in one part and round bad curves and through complicated junctions, requiring slow running, at other places.

NORMAN D. MACDONALD.

[The Reading's fast Atlantic City train which makes the time mentioned in the note of S. M. V., published in our issue of Sept. 11, does not stop between Camden and Atlantic City. The speeds given by S. M. V. were: Camden to Pleasantville, 50.5 miles; time, 44 minutes; speed in miles per hour, 68.9. West Collingwood to Pleasantville, 47.4 miles; time, 39 minutes; miles per hour, 72.8. Williamstown Junction to Pleasantville, 33.5 miles; time, 27 minutes; miles per hour, 74.4. Winslow to Pleasantville, 26 miles; time, 21 minutes; miles per hour, 74.3. As the start was made from Camden, of course some time was lost in getting up to speed. Pleasantville, however, is about five miles before the stop at Atlantic City, and the trains pass that station at their maximum speed, or thereabouts. The locomotives which do this running are Vauclain, 4-cylinder compounds made by the Baldwin Locomotive Works. The cylinders are 13 and 22 in. ×26 in. The drivers are 84½ in. diameter. The total weight is about 143,000 lbs. The weight on the drivers is about 78,600 lbs. The total heating surface is 1,835.1 sq. ft. The grate area is 76 sq. ft. The firebox heating surface is 136.4 sq. ft. The regular train consists of seven day coaches and one Pullman. Each day coach weighs 59,000 lbs., the Pullman coach weighs 87,600 lbs. Below is a table showing four runs by train No. 17, made in regular service. This is the Reading's 4 p. m. train mentioned in S. M. V.'s letter of Sept. 11.



Reading Engine No. 1027—Mate to No. 1026.



Profile of Atlantic City Railroad (Reading System), Camden to Atlantic City.

(The grades are in feet per mile.)

FOUR RUNS OF THE READING'S TRAIN NO. 17, CAMDEN TO ATLANTIC CITY.

Stations.	Distance. Miles.	June 10. Time.	June 20. Time.	June 27. Time.	July 3. Time.
Camden	.0	4:09	4:11	4:11½	4:13
West Collingswood	3.1	4:14	4:17	4:18	4:20
Haddon Heights	5.5	4:16½	4:21	4:21	4:23
Magnolia	7.9	4:18½	4:23½	4:23½	4:26
Clementon	12.0	4:22	4:28	4:23	4:30
Williamstown Junc	17.0	4:26¼	4:32¾	4:32½	4:35
Cedar Brook	19.9	4:28½	4:35	4:36	4:38½
Winslow Junc	24.5	4:32	4:39½	4:40	4:43
Hammonton	27.6	4:34½	4:43	4:43	4:46
Elwood	33.8	4:39¾	4:48	4:49	4:51
Egg Harbor	38.7	4:43	4:52½	4:52½	4:55½
Brigantine Junc.	43.5	4:47	4:57	4:57	5:00
Pleasantville	50.5	4:52½	5:03	5:04	5:06½
Meadow Tower	53.8	4:55	5:06	5:06	5:10
Atlantic City Depot	55.5	4:56¼	5:08	5:08	5:11½
Engine		1026	1026	1026	1026
Cars		11 Comb. Coaches. 1 Parlor.	11 Comb. Coaches. Parlors.	11 Comb. Coaches. Parlors.	11 Comb. Coaches. Parlors.
Weight of cars (lbs.)		371,960	715,320	706,480	696,000

The speed in miles per hour from West Collingswood to Williamstown junction was 68.1 with the light train of June 10. It was 57 miles an hour June 27, with a train of 706,480 lbs. exclusive of the weight of engine and tender. From Williamstown Junction to Pleasantville the speed went up to 76.6 miles an hour on June 10 and to 63.8 on June 27; but it was even faster June 20 with a train 9,000 lbs. heavier; that is, it reached an average of 66.4 miles an hour in the run from Williamstown Junction to Pleasantville. We have taken these three points, West Collingswood, Williamstown Junction and Pleasantville, for reasons that will be apparent to anyone who inspects the profile which we reproduce herewith from our issue of June 19, and, by the way, the reader will find in that issue further particulars of some of these runs. Williamstown Junction is near the summit, and thence to Pleasantville there is a drop of 130 ft. on an undulating profile. Naturally, the train would begin to slow up after passing Pleasantville, as the final stop is only five miles beyond; and time must be lost in getting out of the city limits of Camden. Hence we have taken these three points in computing the speeds made. One can very easily get the speed from Camden to Atlantic City station from this table. The time given at Camden is the actual start, the instant of the whistle signal in the cab, as near as it is recorded, and the time at Atlantic City depot is the time when the locomotive comes to an absolute stop, not when entering the station; at least we are so informed by responsible authority. Previous to June 10 (the first run recorded here) there had been a week of racing, so called, when very fast running was made. That was stopped about June 15 and thereafter orders were given to train No. 17 not to make up any time on the schedule. This explains why the time of June 10 is so much faster than that of either of the later runs.—Editor Railroad Gazette.]

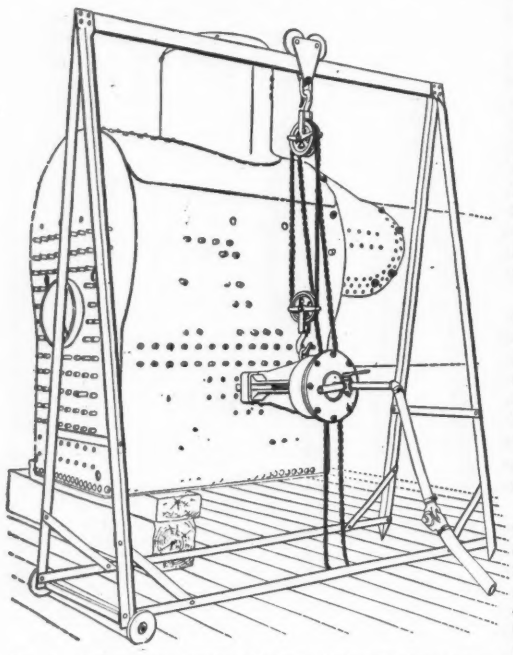


Fig. 2.—Pneumatic Staybolt Cutter—Union Pacific Shops.

Compressed Air in the Shops of the Union Pacific Railroad at Omaha.

BY H. N. LATEY, S. B.

A machine shop not equipped with modern conveniences labors under a great disadvantage. Probably no one thing has reduced the expense of handling heavy material and increased the capacity of a shop to such an extent as the introduction of apparatus using compressed air. The ease with which it adapts itself to almost any work, its simplicity and perfect safety in the hands of the ordinary workingman, make this an ideal system for the transmission of power in a railroad shop.

The Union Pacific Railroad began using compressed air for small tools in 1890. To-day, they have in their Omaha shops three compressors with a capacity of 1,200 cu. ft. per minute, supplying compressed air at a pressure of 115 lbs. to more than fifty different pneumatic machines. The air is carried by a network of pipes to all parts of the shop, and at convenient places connection may be made to any of the air machines by the use of the standard air-brake coupling. To give the system a greater capacity, three storage tanks with a combined capacity of about 1,200 cu. ft. are located near the points of greatest consumption.

In the boiler shop is a pneumatic riveter with a reach of 6 ft., which exerts a pressure of 50 tons. This machine, which was built by the Morgan Engineering Co., of Aliance, O., does all the machine riveting, driving from 50 to 60, ⅝-in. rivets per hour. Three men are required to operate it.

A pneumatic device for breaking staybolts is shown in Fig. 1. This machine, which is one of the Baird patents, consists of 15-in. cylinder with a leverage attachment giving a pressure of 50 tons on the pulling bar. This bar is threaded its entire length and has a hook at the end which lays hold of the bolt to be sheared. The machine, which is supported from a traveler on an iron frame similar to that shown in Fig. 2, is raised and lowered by a chain-block, a split nut on the pulling-bar facilitating the adjustment from bolt to bolt. The entire firebox of a locomotive is cut out with this machine, the ends of the staybolts being punched out by the riveter described above.

Another machine, also a Baird patent, cuts off the staybolts after they have been screwed into place. This device, which is shown in Fig. 2, consists of a 15-in. cylinder operating a large pair of nipples. Staybolts to 1¼ in. diameter are cut off at the proper distance from the plate to allow for heading over, without any danger of loosening. The machine weighs about 450 lbs., is supported as shown in the figure, and is operated by two men. It is worthy of notice in passing that all of the staybolts are screwed into place without the necessity of squaring their ends by means of a clutch used in connection with the portable drills.

Staybolt holes are reamed out and tapped, staybolts are screwed in, tubes are rolled and a large amount of similar work is done by special attachments to the portable drills. The Phœnix, Moffit, Baird and Manning drills are used in this connection. The last is a patent of Mr. J. H. Manning, Assistant Master Mechanic of the Union Pacific, and is the most economical. This device, which is a small Brotherhood engine geared to the drill, shaft is said to develop 5.9 H. P., with 25 per cent. of the air used by drills of the turbine type.

A Brotherhood engine, with 2-in. cylinders, is mounted on a truck, and by means of a pulley may be belted to any of the milling or planing machines which it is necessary to run when the steam engine is shut down. A 6-in. emery wheel, running at 2,500 revolutions, is driven by a small Pelton wheel, using compressed air. This machine, which is screwed to the corner of the tool bench, sharpens all the tools used in this department. Nearly all of the calking is done with the Boyer pneumatic hammer, the operation of which was described in the *Railroad Gazette*, Oct. 2, 1896.

Another air device used in this department is a cylinder which holds the end-plates during the process of flanging. This cylinder is fastened to one of the roof trusses and a large casting at the end of the piston rod is pressed down on the plate to be flanged, holding it securely in place while while it is being hammered over.

Just outside of the boiler shop is a large vertical pneumatic punch, Fig. 3, which punches staybolt holes in the boiler plates. This machine consists of a 40-in. cylinder supported on a framework of I-beams. The pedestal, an old driving wheel with a part of its axle, rests on a similar construction under the ground, and the whole is kept rigid by the braces shown in the figure. A small three-way valve controls the adjusting and a large one operated by the hand-wheel controls the punching. This machine was constructed at a small expense in the shops, and does all the punching of flat plates up to 12 ft. in width. It punches a 1-in. hole in ¾ steel.

In the tin shop, oil can and bucket bottoms are stamped out, all flanged by a pneumatic punch. The shears for cutting sheet-iron and tin have a small air cylinder attached which greatly facilitates this work.

In the machine shops the familiar pneumatic hoist is found above every machine where any heavy lifting is to be done. Heavy cylinder castings are lifted from the floor to the boring-mill and transferred from the boring-mill to the planer by one man. Heavy driving-wheels are centered and removed, and a large amount of similar work is done with these convenient lifts. It is estimated that these devices save 50 per cent. of the cost of handling this class of material. A novel method is used in making these hoists. A piece of ordinary lap-welded tubing of the required dimensions is made perfectly smooth and cylindrical inside by forcing a mandrel through it with the hydraulic press. The regular piston with leather buckets is found to be sufficiently tight with cylinders thus treated, and after five years' operation no reason is found for changing this method of construction.

On our right as we enter the north machine shop is a nut tapping device using compressed air. This machine has six vertical revolving spindles with removable taps. Over each spindle is a pneumatic piston which forces the nut down on the reamer or tap until the thread takes hold. One man operates all six spindles. Further on is a 14-in. cylinder which presses driving rod brasses into the straps, and in another part of the shop is a smaller cylinder which presses the couplings into the air hose.

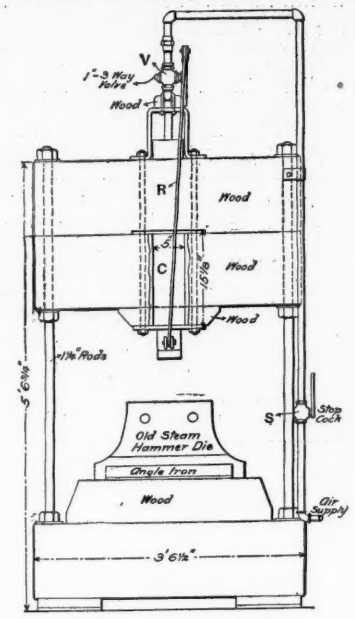


Fig. 5.—Pneumatic Hammer.

In making repairs to the steam-chests and cylinders of a locomotive the chips and dirt which find their way into the steam passages are blown out by filling the boiler with air at 100 lbs. pressure and slightly opening the throttle. This method of blowing out the steam passages saves the time and expense of getting up steam and does not put the machinists to the inconvenience of working on a hot engine. After the repairs are all made the pressure in the boiler is again raised to 100 lbs., and this air carries the engine from the machine shop to the roundhouse. When the locomotive is not going into immediate service, this method of moving is a great convenience.

In the yard are several pneumatic hoists on cranes which save much time and labor loading and unloading wheels, axles, etc., the hoist at the foundry for unloading scrap doing in four hours with two men what it took six men 10 hours to do by hand.

In the blacksmith shop is a portable forge, Fig. 4, using the full pressure of compressed air. It consists of a 3-in. pipe (*a*) which is open at the bottom, and which opens into the fire above. Compressed air at 100 lbs. pressure is forced through a $\frac{1}{16}$-in. hole in the end of the air pipe (*b*). This siphons a large amount of additional air through the bottom of (*a*), and by varying the pressure at the valve we obtain any desired blast. This forge, which is apparently new to some parts of the country, will give a welding heat on a 2½-in. bar or heat rivets as fast as two gangs can drive them. The amount of air used is not noticeable to a plant of this size. The wrought-iron ears which are cast in some forms of brake-shoes are stamped cold by a pneumatic stamp.

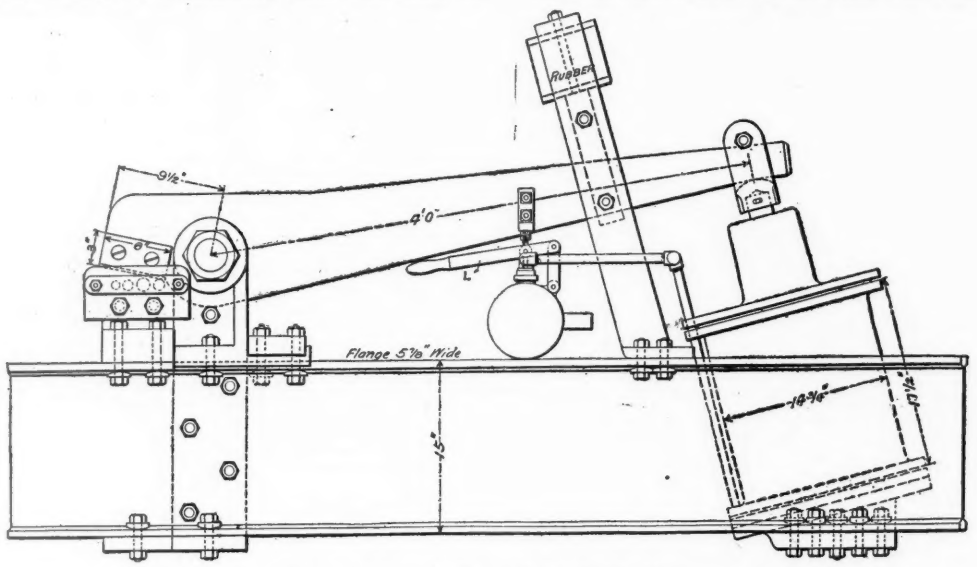


Fig. 6.—Pneumatic Shear—Union Pacific Shops.

A large amount of the scrap iron removed from cars

and engines may be used again by straightening and cutting off the damaged ends. Fig. 5 is an elevation of a pneumatic hammer, used to straighten rods and bolts. Opening the stop cock (*s*) admits air to the cylinder (*c*), and sends the hammer down. When the downward motion is nearly completed the valve (*v*) shuts off the air and opens the exhaust, the momentum acquired striking the blow. A ⅜-in. steel spiral spring inside of the cylinder forces the piston up until air is again admitted by the valve (*v*) which is operated by the rod (*r*) fastened to the hammer head. By regulating the pressure by the stop cock (*s*), the force of the blow may be varied from the lightest tap to a blow which shakes the building. This machine was designed and constructed in the shop.

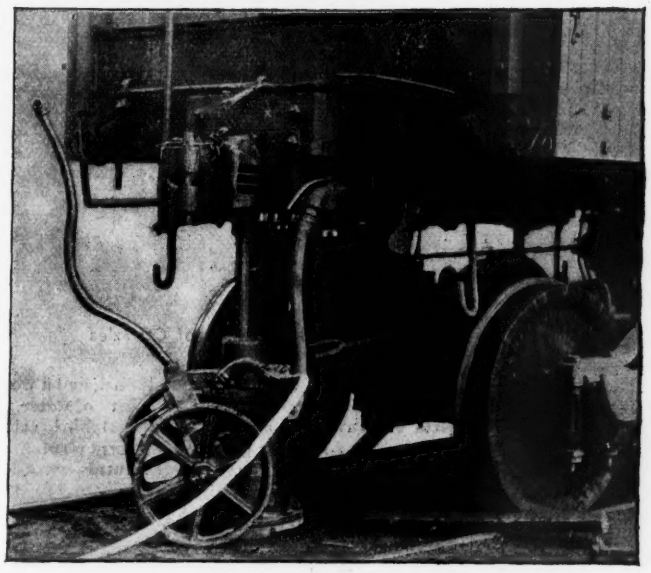


Fig. 7.—Pneumatic Jack—Union Pacific Shops.

Fig. 6 gives a side view of a pneumatic shear, which cuts rods and bolts up to a $1\frac{1}{16}$ in. diameter. It consists of a wrought iron shear with a 4-ft. leverage, which is operated by a 14-in. air-cylinder. It is mounted on two 15-in. I-beams, 7 ft. long, which are braced and bolted securely together. The blades are made of hardened steel and are removable for grinding. The lower blade, for cutting round iron, has four holes for bars of various diameter. For cutting flat bars a blade similar to the upper one shown in the drawing is used. Raising the level, *L*, admits air to the bottom of the cylinder, which forces up the piston and cuts of the bolt. The rubber buffer shown stops the shear and prevents injury to the cylinder. When the bolt is cut off, the valve releases automatically and an $1\frac{1}{32}$-in, steel spiral spring forces the piston down and opens the shear. One man operates both of these machines.

In the carshops are some of the most important of the air apparatus, the pneumatic jacks. These jacks, of which there are four sizes, 12 × 14 in. for freight cars, 12 × 30 in. and 18 × 30 in. for passenger cars and 18 × 20 in. for trucks, are as important to this department as the hoist is to the machine shop. Fig. 7 is a view of one of the 12 × 14-in. jacks under a freight car. It consists of an iron cylinder with two lugs, by which it is carried from place to place on the two-wheel truck shown in the figure. A three-way valve admits air to the bottom of the cylinder and raises the piston. Turning this valve shuts off the air and opens the exhaust, a spring forcing tho piston down when the jack is empty. The hole which admits air to the cylinder is so small that it is impossible for the car to drop suddenly, even though the hose connection be broken. The general construction of the larger jacks is similar to the one just described. A small gage on the passenger car jacks gives the pressure necessary to raise the car and, knowing the size of the piston, the approximate weight lifted may be calculated. This weight is found to be accurate enough to use in setting the air-brakes.

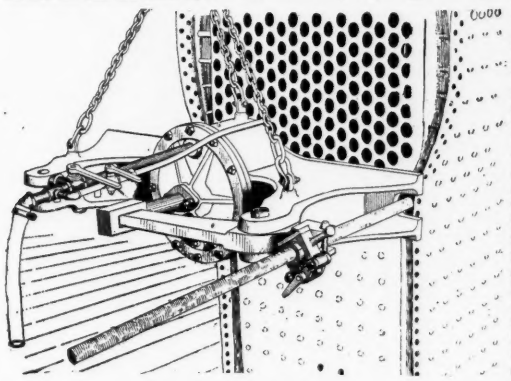


Fig. 1.—Pneumatic Device for Breaking Staybolts—Union Pacific Shops.

With the old hand jacks it took two men 10 minutes to do the work done by one man in three minutes with the pneumatic jacks. Changing three pair of wheels on a truck, which formerly took six hours, is done now with the truck jacks in an hour and a half.

The Manning pneumatic sand-paper machine, which was described in the *Railroad Gazette*, Oct. 2, of the current year, is used in sand-papering passenger cars. This device, which consists of an air turbine rotating a flat piece of sandpaper, will finish a 50-ft. baggage car in 15 hours, which required 50 hours to sandpaper by hand

A device constructed on the principle of an atomizer is used in painting freight cars and other rough work. The walls and roof of a shop 150 ft. × 200 ft. were whitewashed by this machine in 10 hours. Paint is mixed by putting its component parts into a tank through which compressed air is forced.

The car seats and carpets are dusted and the cars are cleaned by means of compressed air.

Mr. J. H. McConnell, Master Mechanic of the Union Pacific, figures that it saves $700 per month in the Omaha shops. It is due to him and his assistants that the shops are so completely supplied with pneumatic apparatus, compressed air having been introduced wherever it showed signs of economy. Many of the devices described above are entirely original with the mechanical department and almost all of them were designed and built in the shops.

The Reorganization of Corporations.*

[*Concluded from page 778*]

With scarcely an exception, whenever a great railway company has passed into the control of the court, the creditors have first learned through the newspapers that, with the knowledge of none but its immediate officers, and through collusive proceedings, in which they in fact have represented both sides, they, or some of them, have been appointed receivers; that from the moment the court in determining the complicated questions which must arise during such a receivership is to see and hear with the eyes and ears of a party to the controversy. Managers whose discharge by the stockholders was imminent have thus been continued in control of the property, and even when it became apparent that the original bill was likely to fail and the appointment of receivers in suits to foreclose has been sought, the same secrecy has surrounded the application and the greatest pains have been taken to see that the interested parties had no notice and no opportunity to be heard, in order that the same receivers might be retained in office with a new and better title.

The results of this first step are inevitable. The debtor through its selected representatives becomes the agent and adviser of the court. No man in the least degree familiar with railroad methods is ignorant that in a railroad system the interests of the whole and of a part may be widely divergent. The receivers must determine how expenses shall be divided between different lines, by what route traffic shall be sent, how rates shall be fixed, how branches can best be used to swell the earnings of the main line. They have it in their power to increase or diminish the earnings and the expenses of any road. They can spend its income in repairs or improvements and can so state their accounts as to raise or depress the apparent value of its securities. Their action in matters of this kind is of vast importance to many men, but while in name they act as the agents of the court their action is not judicial. The court cannot hear and determine the questions which they must decide any better than it could direct the progress of a military campaign. After the receivers have acted, the mischief in most cases is done, and when creditors discover at a later day what has happened, the usual course of judicial proceedings affords them no remedy. The receivers, therefore, are virtually and necessarily in irresponsible control of the property.

If the representatives of a single interest, and that the interest of the insolvent debtor, are trusted with this power, what must be the consequences? A creditor interested only in a branch line wishes to know what his security is worth. To whom shall he apply for information? He thinks that his property is managed badly. To whom shall he go for redress? He wishes to establish the facts upon which to found some application to the court. How shall he obtain the evidence? The receivers are in possession of all the books and control all the witnesses. No employee dares to communicate any information if he thinks that his employers will object. No shipper wishes to antagonize men who can facilitate or injure his business. Instead of approaching a trustee anxious to give him all possible information and to respect all his rights, the creditor deals with a party to the controversy, who perhaps tells him that he is acting for the whole system, and that the interests of the whole require an injury to his part. Instead of finding as the officers of the court men whose only object is to deal justly with all, and who have no personal interests, he finds men definitely committed to a policy and determined to carry it out.

Many creditors have become dissatisfied with such representatives and while in no way disputing their honesty, have felt it obviously improper that the same persons should represent at the same time entirely opposing interests. Where the terms of a lease or traffic contract cannot be carried out a new agreement must be made or the owner must be restored to possession. If the first course is to be adopted, it is clear that the same persons cannot act for both sides in making the new agreement. If the latter, there can be no restoration of possession while the property is operated by receivers who control it in the interest of the defaulting debtor. The trustees of divisional mortgages or lessors for these reasons have in many instances sought an independent control of their property. They have pointed to the letter of their contract, they have relied upon the clear justice of their claim, they have been encouraged by the assurance given by high authority that "while the court will continue to operate a division of the system until some application be made, yet the right of the lessor or mortgagee whose control is impaired to insist upon possession or foreclosure will be promptly recognized" and the disruption of the system if it comes "will come from those who seek separation and have a legal right to do so." But the applications have been opposed by the receivers and their counsel. This shows the true position of receivers thus appointed. The officers of the court—"the eyes and ears" of the court—in a representative capacity the court itself—have resisted the application of the court's wards for the appointment of a separate trustee to represent a distinct interest. As the official advisers of the court they sit by its side on the bench, while at the same time they appear before it as parties.

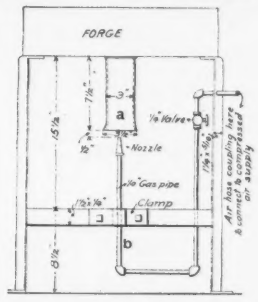


Fig. 4.—Portable Forge Using Compressed Air.

In many cases the organization of the debtor corporation has been kept alive at the expense of the creditors, through an allowance made for the purpose by the court out of funds in the hand of the receivers, so that the corporation is provided with the means of resisting the enforcement of its contracts. Sometimes in the name of this corporation, through counsel nominally employed by it, sometimes directly and through their own counsel, but always with the money of the creditors, the receivers have opposed foreclosure proceedings, and every other attempt by creditors to assert their contract rights, which could lead to the disintegration of the system. The result has been that the action of the courts in these suits through receivers of their appointment has resulted in a practical denial of justice.

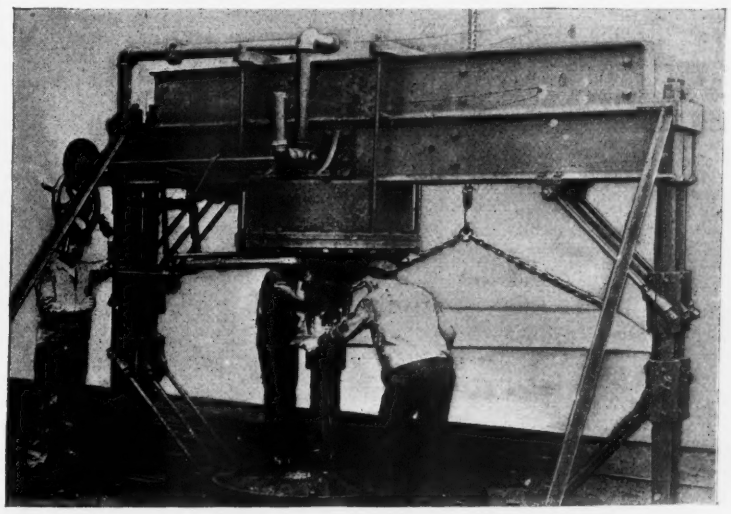


Fig. 3.—Pneumatic Punch—Union Pacific Shops.

The debtor has been left in possession not only of its own property but of other properties to which its right has been forfeited, and has been enabled from a position of apparent neutrality and so of peculiar advantage, to prevent creditors from obtaining what their contracts gave them. The possibilities of delay in such cases are very great. Under the decisions a *supersedeas* bond may be given on an appeal from a decree of foreclosure without serious risk to the sureties; hence an appeal is always easy, and if the ingenuity of counsel can detect a flaw in the proceedings, another postponement is secured. In a word, the court through its officers holds the creditor at bay until he is ready to compromise his rights

The result is that after a long and expensive struggle the self-constituted reorganization committee appears and bondholders are offered their choice between a contest conducted at great disadvantage and expense and the acceptance of such terms as may be offered. While in theory they need not accept, in fact they dare not refuse. No man can be sure that his associates in the contest will not yield, or sell their claims. Whenever an agreement is reached the obstruction ceases. The receivers are as willing to help as they were to hinder. The foreclosure proceedings move swiftly and the officers of the court no longer resist the claims of suitors at its bar. The receivership has accomplished its purpose.

The expense of the reorganization has been in many cases enormous, and in fixing it there is no one to audit the accounts of the committee or to determine their re-

*From the address of President Moorfield Storey before the American Bar Association at Saratoga, N. Y., Aug. 19, 1896.

muneration except themselves—no one to represent the creditors, who suffer while their trustees profit.

Proceedings like these are of very evil example. As was pointed out in England by a leading journal, when a cabinet minister resigned upon the failure of a corporation in which he had been an ornamental director, they strike at the very root of thrift in the nation. Many a man who has saved painfully and slowly, denying himself every little indulgence for the sake of his family, finds his savings swept away by the mismanagement of

Fig. 1.—Etchings of Car Axles.

a corporation and sees the managers continued in charge in spite of all the opposition that creditors can make. When he finally receives a new security of less value than his first investment, secured by contracts in no respect stronger than those which proved worthless when needed to protect his rights, he resolves that in future he will spend and enjoy as he goes rather than save that strangers may get the fruits of his toil. To the reckless use of power by the managers of great corporations and by those who profit in their downfall; who secure advantages at the expense of others powerless to defend themselves and who pay themselves out of money belonging to others sums which are entirely out of proportion to the services that they render, we must attribute much of the discontent, the hatred of capital and capitalists, of corporations and their officers, which underlie the political movement that now excites our alarm.

It is to the courts of the nation that we must look for protection against many of the heresies that are now prevalent. Their authority rests peculiarly on the respect of the people for their absolute impartiality, and in the long run they cannot retain that respect unless they observe the well-settled rules of judicial procedure and unless they regard and enforce every legal claim. Men must be left to determine for themselves whether their interests will or will not be served by the assertion of their rights. The moment that the courts, from any consideration of temporary expediency or private opinion as to what will best secure the interest of parties, undertake to vary their contract or deny their rights, that moment the confidence of the community receives a shock, and no man knows on what he can rely. It is easy to assert and impossible to prove, but I believe it to be true that if the courts had in every instance refused to entertain these applications for the appointment of receivers in fact made by the debtor corporation, or even if they had selected impartial receivers, and, making no effort to preserve existing systems, had facilitated the enforcement of every agreement, the railroads of the United States would have been reorganized more promptly and on a more enduring basis than is now possible, while the confidence of the community in the efficacy of law and the sanctity of contracts would have been far greater. Judicial action which impairs the obligation of contracts is more dangerous than any statute which aims at the same result.

When the court through its officers undertakes to manage a railroad for years, and by these officers to decide, as it must without hearing, the questions which arise in its operation; when it appoints these officers and in so doing grants the final relief sought without notice in *ex parte* proceedings, it violates the fundamental rule of our constitutional system, so carefully framed to make ours "a government of laws and not of men."

Abrasion and Etching Tests of Wrought-Iron and Stee Car Axles.

Mr. L. R. Pomeroy, Agent of the Cambria Iron Company, has furnished us with the following report of some tests made in the laboratory of that company. These tests were made on pieces cut from both iron and steel axles used on several different railroads. Tests were made on 25 different axles, and the results which are here given have been selected as being, as nearly as possible, representative of the whole.

Abrasion Tests.—These were made on small 1-in. cubes cut from the wheel-seat portions of the axles and near the surface, the wearing face of the cubes being the portions adjacent to the outer surfaces of the axles. The cubes were all planed accurately to 1-in. dimensions and carefully weighed before and after testing.

The tests were made on the Riehle abrasion testing machine, on a hard, smooth steel disk, about 12 in. in diameter, which revolves in a horizontal plane at the rate of 60 or 62 revolutions per minute. The cubes are held in a frame and rest on this disk, the pressure being obtained by a weighted lever above. A cone motion moves the cube and frame in and out over the disk, to which is attached a revolution counter. The tests were all made on the same disk and under a pressure of 50 lbs. to the square inch. The number of revolutions in all cases was 200,000, taking about eight days' time. Two sets of tests were made on each cube and gave practically the same results.

The results of tests and the chemical analysis of the axles are given in the accompanying table. The amount of abrasion or wear is given in grams and also in percentages of weight or of volume of the original cubes. A diagram is also given, showing the comparative wear of several of the specimens which were tested. The results show that the open-hearth treated axle has the best wearing qualities; next comes the untreated open-hearth axle. The Bessemer freight No. 9 axle shows more wear than some of the wrought-iron axles.

Etching Prints.—In order to represent the structure of the material experimented upon, a full-size sample of each grade was cut from the several axles and finished off into a disk .9 in. thick. The faces were made parallel and one was given a polished finish free from tool marks, while the other face had a hole tapped into the center for a hook by which it was suspended face downward in the etching solution.

The etching solution used varied with the material. In the case of the wrought-iron specimens the mixture was three parts of water to one of sulphuric acid by volume. This acted rapidly on the material, which had to be carefully watched, but it gave quick and good results. With steel the results were found to be better,

Fig. 3.—Etchings of Car Axles.

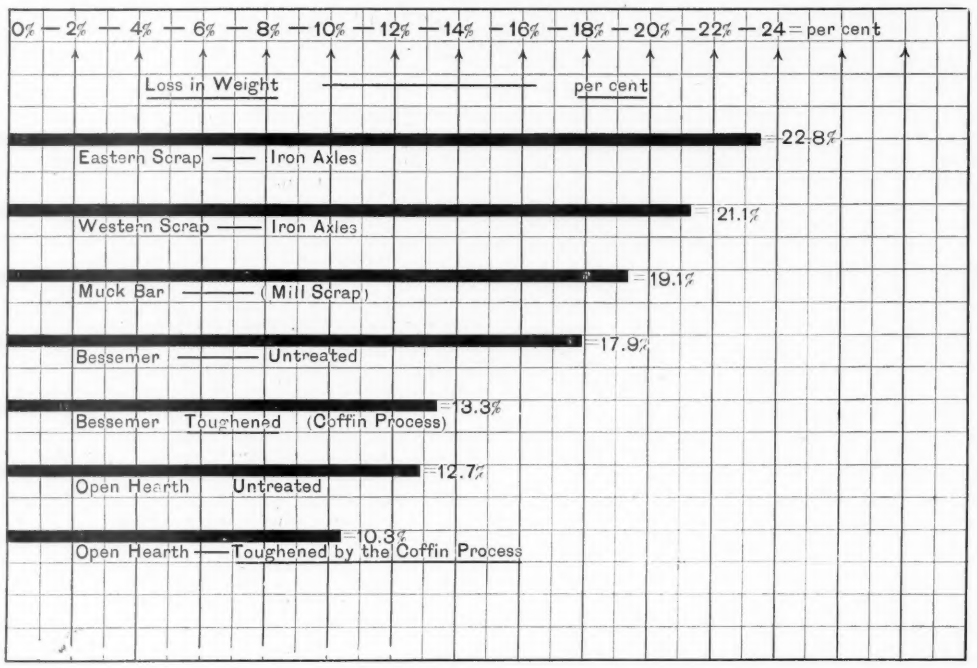
as the action of the acid was retarded, and a weaker solution was used, made up of 100 parts of water, four parts of nitric acid and five parts of sulphuric acid by volume. This solution gave very uniform results.

The time of immersion in these solutions varied considerably with the specimens. In all cases the depth of the etching determined the end of the process, by judging of its utility in producing a print directly from its surface that should represent the structure of the material to its best advantage. When this point was reached the specimens were removed and cleaned. This surface was then inked and printed from, the accompanying illustrations being reproductions of some of the prints thus made.

Fig. 1 is taken from a section of a scrap-iron axle that had not been very carefully piled, and was cut from a point near the bearing. The axle was found among old iron in a scrap pile at the rolling mill. It is of a poor

Fig. 2.—Etchings of Car Axles

grade of iron and was piped in several places almost the length of the axle. It appears that the weak points show themselves in the light spots. These occur mostly in the line of welds where they are barely noticeable. If a weld is not good the action of the acid is such that a pitting of the material takes place at that point which in a dark portion of a print shows up very plainly. By this it is seen that in this print imperfect welds occur in three places, one near the upper edge and two on opposite sides of the center (above and below). The center


0% — 2% — 4% — 6% — 8% — 10% — 12% — 14% — 16% — 18% — 20% — 22% — 24 = per cent
Loss in Weight per cent
Eastern Scrap —— Iron Axles 22.8%
Western Scrap —— Iron Axles 21.1%
Muck Bar —— (Mill Scrap) 19.1%
Bessemer —— Untreated 17.9%
Bessemer Toughened (Coffin Process) 13.3%
Open Hearth Untreated 12.7%
Open Hearth —— Toughened by the Coffin Process 10.3%

Loss in per cent.: Eight days' run: 200,000 revolutions. Riehle abrasion testing machine.

Comparative Wear—Axle Tests by Abrasion.

ABRASION TESTS OF CAR AXLES.

No.	Tests of axles.	Weight of a cubic inch, gms.	Loss per cubic inch, gms.	Loss per cent.	Analysis. C.	Si.	P.	S.	Mn.
	A.—Wrought Iron Axles.								
1	Scrap axle	125.75	24.00	19.1	.09	.160	.175	.027	.....
2	" "	125.80	24.20	19.2	.09	.160	.175	.027	.....
3	Michigan Cent. Ry	125.04	26.38	21.1	....	.138	.302	.033	.....
4	" " "	126.00	24.48	19.4	....	.050	.098	.052	.25
5	" " "	125.41	28.78	22 9	.....	.134	.234	.057	.....
6	N. Y., Ont. & W "	125.00	29.08	23.2	.....	.164	.213	.039	.26
7	" " " "	125.00	29.65	23.2	.....	.164	.213	.039	.26
8	" " " "	125.44	27.65	22.0	.....	.147	.237	.032	.32
	B.—Steel Axles.								
9	Bess. freight—N	128.20	25.92	20 2	.12	.012	.078	.109	.52
10	" " —N	127.90	20.02	15.7	.10	.....	.075	.101	.54
11	" " —T	127.95	17.01	13 3	.10	.....	.075	.101	.54
12	O. H. Pass. No. 21,159—N	128.26	20.78	16.2	.38	.....	.049	.....	.60
13	" " " 21,159—T	128.26	19.42	15.2	.38	.....	.049	.....	.60
14	" " " 21,812—N	128 25	16.55	12 9	.38	.....	.....	.....	.61
15	" " " 21,812—T	128.24	14.06	11.0	.38	.....	.....	.....	.61
16	" " " 21,795—N	128.00	19.02	14.9	.45	.....	.056	.....	.51
17	" " " 21,795—T	128 05	12.35	9.6	.45	.....	.056	.....	.51
18	" " " 21,827—N	128 04	11.22	8.8	.47	.....	.043	.....	.50
19	" " " 21,827—T	128.04	10.41	8.1	.47	.....	.043	.....	.50
20	" " " 21,845—N	128.17	20.92	16.3	.45	.....	.054	.....	.55
21	" " " 21,845—T	128.20	12.86	10 0	.45	.....	.054	.....	.55
22	" " " 22,150—N	128.00	11.66	9.1	.41	.....	.049	.....	.75
23	" " " 22,150—T	128.06	9.69	7.6	.41	.....	.049	.....	.75
24	" " " 22,153—N	128.00	14.52	11.3	.38	.....	.024	.....	.68
25	" " " 22,153—T	128.10	13.58	10.6	.38	.....	.034	.....	.68

Steel axles marked N. are in natural state after forging. "T." are "Coffin Treated." Heats Nos. 22,150 and 22,153 are basic steel; the rest acid steel.

pipings are quite large and very noticeable in the specimen itself.

The print also shows that several grades of iron were used in the axle, which would tend to make the welding a difficult operation. The variation is extremely noticeable, though slightly exaggerated by the action of the acid. It is these lines of welds that give away first and make the rough fibrous appearance that wrought-iron axles have when they become worn.

Fig. 2 was taken from a high grade of axle iron as used

Fig 4.—Etchings of Car Axles.

by the Michigan Central Railroad, representing "Western" piling and practice in this material. A disk was taken from the original axle, the tooling of which showed a uniform material free from piping or irregularities. No idea could be formed of the effect of wear upon the journal, as the section was taken from the wheel seat.

No bad welds are exhibited, though one portion shows an inferior grade of iron as compared with the major portions of the axle. The line of weld through a small section is shown as imperfect, though the greater part of the outline is very distinct, and shows solid material. When this poorer grade of iron breaks out upon the surface it is found to be rough and honeycombed from the action of the acid, indicating the portions of the axle that will first show wear and cause an irregular outline of surface.

Fig. 3 shows a material that is seldom excelled for uniformity of piling and working. It is slightly open-grained, caused by foreign substances in the material. This may reduce its wearing resistance, but its strength may be depended upon, as no weak spots are likely to develop. In this grade of iron welds of the best class are assured, free from piping.

Fig. 4 was taken from a New York, Ontario & Western iron axle that is intended to represent "Eastern" practice in that line. Four small pipings are shown in a horizontal line about one-fourth the diameter of the specimen from the top. The welds are very distinct, and the heating could not have been very uniform. A porous grade of iron is exposed to the wearing action of the journal, and a rough surface would soon develop with wear.

Fig. 5 shows the structure of an open-hearth steel passenger axle, after having been treated by the "Coffin" toughening process. A study of the print shows that the uniform structure of the steel is not affected otherwise than a refining action around the surface by which a closer-grained material is produced to resist the wearing of the material in the journal. The line of separation showing the effect of the toughening process is not very distinctly marked, but shows a gradual gradation of one into the other.

Transmission of Electric Power from Niagara Falls to Buffalo.

We have occasionally spoken in a general way of the transmission of electric power from Niagara Falls to Buffalo, but now that cars have actually been run by power generated at the Falls, it will be well to give a description of the new types of apparatus which are used and to speak of the details of the construction of the plant.

The contract between the Niagara Falls Power Company and the Buffalo Street Railway Company calls for the immediate delivery of 1,000 H. P. at $36 per horse power per year and for 10,000 H. P. by June 1, 1897, should there be a demand for it, and also for 10,000 additional horse power within each successive year thereafter for four years, providing it is wanted.

All the construction work in connection with the building of the plant as far as the city limits of Buffalo was done by the Cataract Construction Co., while the distribution, after it has reached the city limits, is under the direction of the Cataract Power & Conduit Co.

The two-phase current starting from the generators in the power-house is first led to the switchboard, and then in lead-covered cables to a transformer house on the opposite side of the canal. Here the cables are connected to four switches, and from this switchboard they pass to the step-up transformers erected on a platform at one end of the power-house. Each transformer weighs 2,500 lbs., and has a capacity of 935 K. W. (1,250 H. P.), and stands 94 in. high, on a base 64 in. × 56 in. These transformers are cooled by driving a blast of cold air up through the air passages provided in the core and coils. The blast is furnished by a large blower driven by a 54-H. P. multipolar motor, to which it is belted. In the transformers the two-phase system is changed into the three-phase system, and raised from 2,200 to 11,000 volts, and provision is also made for raising the electric pressure to 22,000 volts.

From the transformers three cables pass to the high-tension switchboard, the switches of which are separated by a marble barrier about one inch thick, which prevents arcing from switch to switch at the high pressure.

From the transformer house the wires pass through lightning arresters to the pole line. The poles were erected by White, Crosby & Co. and are placed on one side of a special right of way 30 ft. wide. About 21,000 poles, ranging from 35 to 65 ft. in length and set about 75 ft. apart, carry the wires which convey the current. Each pole is provided with two 12-ft. cross arms for the transmission line and one small cross arm for a telephone line. Each side of each cross arm has space for three pins to carry three insulators, provision thus being made for four circuits of three wires each, the capacity of each circuit being 5,000 H. P. at 11,000 volts pressure, and 10,000 H. P. at 22,000 volts pressure. On the outside of each upper cross arm is a small iron pin, 18 in. high, which serves to carry a galvanized barbed wire used as a lightning conductor and connected to the ground at the foot of every fifth pole.

The insulators weigh about 12 lbs. each and are provided with two annular grooves in the bottom, which effectually prevent any moisture getting to the central pin, on which the insulator is placed. The outside of the insulator is provided with a gutter, running to a point on each side, to carry off the water. These insulators were subjected to a rigid test of an alternating current of 40,000 volts in order to determine the electrical resistance.

The line is 26 miles in length The overhead conductors are of bare, stranded copper, each conductor having a diameter of 350,000 circular mils and each lies in a groove at the apex of the insulators. When the line approaches the station at Buffalo it is taken from overhead to underground, the wires passing from the last pole into a small brick terminal house. In this house connections are made with the underground cables through lightning arresters. The underground cable is laid in a subway consisting of vitrified tile ducts, each duct having a hole 3 in. in diameter. The subway consists of 12 of these ducts, laid 18 in. below the surface of the ground and surrounded on all sides by 4 in. of concrete. Only three of the ducts are in use at present. The insulation of these cables was tested for an electric pressure of 80,000 volts.

The subway terminates in a small brick structure, containing the step-down transformers erected in the rear of the Niagara street power house of the Buffalo Railway Company. As the wires enter this small house, they are connected to a switchboard carrying high-voltage switches and fuse carriers which are separated by partitions of marble in the same manner as on the high-tension switchboard at the Niagara Falls end of the line. From this board, cables are carried through lightning arresters to the three transformers shown in the accompanying engraving. Two of these are in use and the third is held in reserve. Each weighs 7,000 lbs., is 7 ft. high, with a base measurement of 4 ft. × 3 ft. In these step-down transformers the pressure is reduced from 10,700 to 370 volts. The transformers are cooled in a similar manner to that used with the step-up transformers at the Falls.

From the step-down transformers, the three-phase current, divided into two circuits, passes over six cables to the main floor of the power house of the Buffalo Railway Company, where they are connected to another switchboard. Thence they pass to the two six-pole rotary converters, each of 500-H. P. capacity, where the three-phase alternating current at 370 volts is changed into direct current at 500 volts. Each converter armature is provided with three collector rings at one side and a commutator at the other, and may be started either by the alternating current or by direct current from the street railroad lines. The converters may be used in parallel with the other generators, or the current can be thrown directly into the feeders of the railroad circuits.

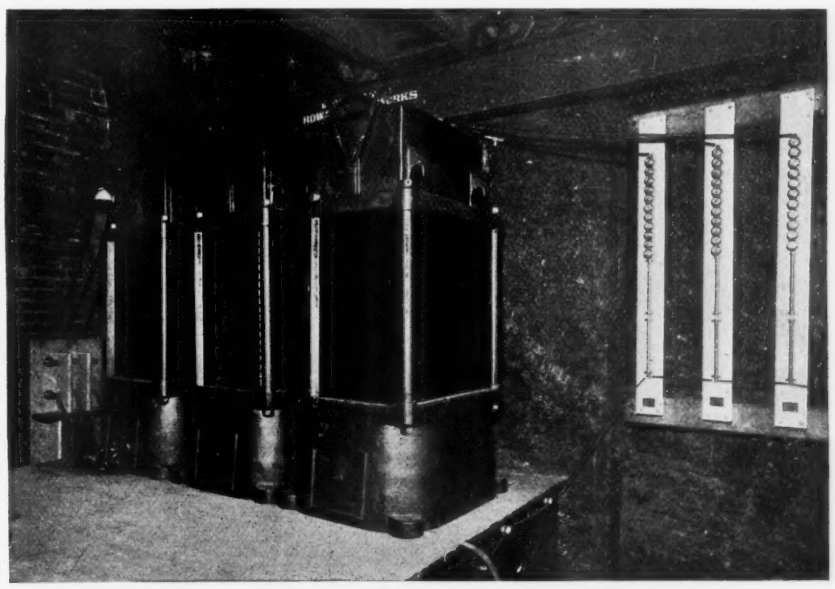
The lightning arresters are of the Wirt type and consist of strips of marble upon which are mounted eleven cylinders, giving one air gap space $\frac{1}{32}$ inch for each one thousand volts, with an allowance of 25 per cent. rise in the potential. In the action of the arrester, the large metal cylinders serve to chill the arc so that, on reversal of the current, the arc is extinguished, no dependence being placed upon any non-arcing property of the metal to put out the arc. In order to limit the current on short circuit, and thus the heating effect, a special solid graphite rod of low non-inductive resistance is used. The transformers and converters were made by the General Electric Company, having been designed especially for this service.

The following table gives briefly the history of the

Fig. 5.—Etchings of Car Axles.

successful attempt to use a part of the wasted energy of Niagara Falls in the city of Buffalo:

Niagara Falls Power Co. incorporated	March	31, 1886
Cataract Construction Co. incorporated	Feb.	10, 1889
Work begun on tunnel	Oct.	5, 1890
Competitive plans invited for development of power and its transmission to Buffalo	Dec.	1891
Canal completed	Oct.	1892
Tunnel completed	Jan.	1893
Application to city of Buffalo for franchise	Jan.	10, 1895
First dynamo started	April	5, 1895
Franchise granted by city of Buffalo	Dec.	16, 1895
Franchise accepted by Power company	Jan.	14, 1896
Cataract Power & Conduit Co. incorporated	July	17, 1896
Work on transmission line begun	Aug.	14, 1896
Transmission line completed	Nov.	15, 1896
The first current sent over the line	Nov.	15, 1896
Final test of line	Nov.	16, 1896
First street car operated in Buffalo by the Niagara Falls current	Nov.	19, 1896



The Step-down Transformers at Buffalo in the Niagara Falls-Buffalo Transmission Plant.

Light Railroads and Narrow Gage.

In his presidential address before the Institution of Civil Engineers (London), Mr. John Wolfe Barry said some things which we can heartily indorse about the suggestions to make the new light railroads in England of narrow gage. It would probably be a stupendous economical error. We quote some parts of his address:

I have little doubt that light railways will, in many districts, be of great utility, and I earnestly hope for, and fully expect, at the hands of the Commissioners appointed, a well-considered policy. Much will depend upon the inauguration of the system on sound lines. I hold strongly that light railways should in all cases, other than where they will be independent approaches to a port or to a market, be of the same gage as the standard gage of the country. The traffic on these lines (with the above exceptions) must be dependent on the trunk or parent line, and in the nature of things will be small in each individual case.

In such cases the trucks of the trunk line should be able to run on the light railways. The first cost of special rolling-stock ought to be avoided, and the expenses, and the delays and damages due to trans-shipment of cattle and sheep, fruit, fish, vegetables, and the return of manure, should be saved. Again, the expenses of special repairing shops and repairing staff for locomotives and rolling-stock, and the provision of spare engines or stock to provide against breakdown, will be

unnecessary if both are able readily to reach the shops of the trunk lines for repairs, and to be supplemented therefrom.

So far as works are concerned, a light railway should be similar, but slightly superior, to the temporary lines made by contractors in constructing the ordinary standard lines. The rails, sleepers and ballast should merely be adequate for a limited weight upon the wheels of a suitable locomotive, which need not be heavier for the wider gage, while the earthworks may be light, as the gradients for moderate loads may be steep. Bridges over and under roads will be in most cases unnecessary, and Board of Trade safety appliances should be greatly simplified, but the gage should be unbroken at the point of contact. One may learn a lesson in this respect from what a contractor does in the case of his service railway. However much he may cut down the cost, he is never so foolish as to try to save by adopting a narrower gage than the standard gage of the country.

Some small saving in first cost may, no doubt, be gained by the adoption of a narrow gage of, say 2½ ft. to 3½ ft., instead of 4 ft. 8½ in., but in almost all cases the amount saved will be very trifling. The Royal Commission of Irish Public Works, of which I was a member, had careful estimates made of the amount to be saved in the case of ten or twelve light railways then proposed in Ireland, and it was found that a most liberal estimate of the saving by the adoption of a 3-ft. gage, as compared with the Irish standard gage, 5 ft. 3 in., was from £300 to £500 a mile, varying as the district was flat or hilly. Even the larger saving should not be considered in connection with the advantages of an unbroken gage. Take the case of a light railway 20 miles in length, which may perhaps be longer than most of those which may have to be made. The total saving in first cost in even a hilly district of Great Britain may be £8,000, and if we assume the capital be raised at 3 per cent., the annual additional interest will be £240 a year. The additional expenses—some, but not all, of which I have indicated, both in capital and working, as due to a break of gage—will largely outweigh the additional interest, while the disadvantages of delays and damage of trans-shipment will remain.

When there was a break of gage at Bristol between the wide and narrow gages of the Great Western and Midland companies, an allowance in the division of the through rates of 20 miles was made to the company undertaking the expenses of trans-shipment, and farmers and cattle dealers told the Irish Commissioners that they would prefer to drive cattle 20 miles rather than face the difficulties and damage to their stock by trans-shipment.

The Influence of Rails on Street Pavements.*

When the streets of cities were paved with granite or trap blocks, laid on a sand foundation, with a space varying from 1 in. to 2 in. between the blocks, which was thought necessary to afford a foothold for the horse traffic, the section of the rail selected by surface railroad companies did not add materially to the unevenness of the pavement. As a matter of fact, the first rails used were so much of an improvement on the prevalent street pavements that the traffic early developed a tendency to follow the lines of the rails. As this retarded the railroad traffic through a natural unwillingness on the part of teamsters to pull out of the track, the Hewitt or center-bearing rail (Fig. 1) was invented, with the avowed purpose of preventing vehicular traffic following the lines of the rails. While this rail is probably as obstructive to traffic crossing it at a sharp angle as any street rail ever invented, its very brutality partially defeated its object, as a heavily loaded wagon once on the line of such rails leaves it with extreme reluctance. It is, however, largely employed on the surface roads of the city of New York, and it has required an act of the legislature to prevent a further extension of its use. A modification of this rail (Fig. 9) has also been introduced, and is used as a girder rail on one of the cable lines.

The side-bearing rail shown in Fig. 4 as a girder rail presents a very good wheelway for vehicles once between the rails, and thus far is better than the Hewitt rail; but on account of its nearly vertical sides, it is very hard to pull a loaded wagon out of the track, and in crossing at a small angle with a light vehical at any speed, the jerk is about as severe as on the center-bearing rail. A rail of this section is also used as a strap rail, being spiked to longitudinal stringers, as is the center-bearing rail generally.

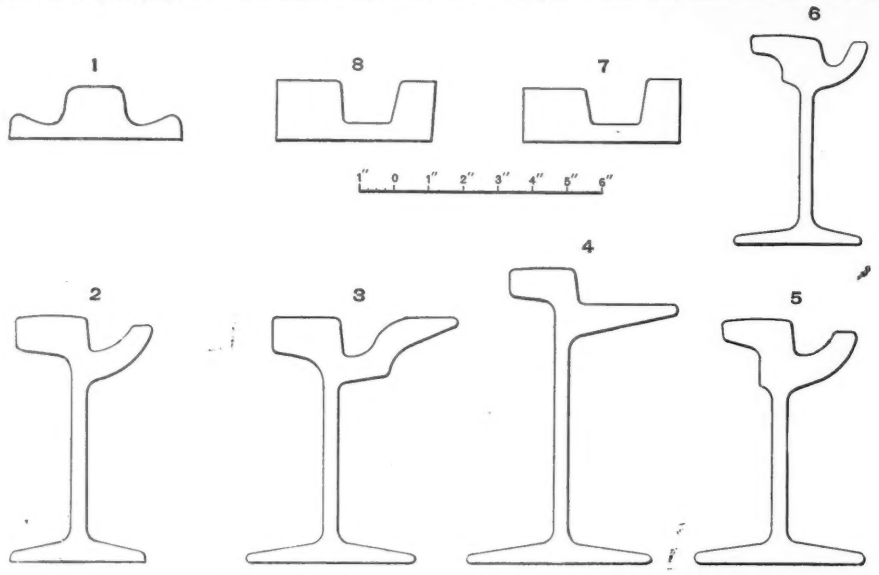
Figs. 7 and 8 show sections that are employed as guard rails on curves and otherwise. They also are strap rails, and when laid on curves it is almost impossible to make the spikes hold so well that water will not splash out from under them. The only excuse for their use is that bending them costs less than bending a girder rail, and, in general, the use of a strap rail on any highway should be prohibited after a near date in all self-respecting countries.

When permission was given to lay a cable road on Broadway, in New York City, both the previously mentioned forms of rail were so strenuously objected to that the Commissioner of Public Works prescribed a grooved rail, as shown in Fig. 5. This was followed on the Third Avenue line by a rail shown in Fig. 2, and on the Twenty-eighth and Twenty-ninth street road the section shown in Fig. 6 was adopted. All of these rails are improvements on any of the forms of rails before mentioned, but all of them are objectionable in that the flange is lower than the tread, which results in an unnecessary unevenness in the pavement, and in Fig. 6 the slot is so narrow and the sides so steep that there is difficulty in keeping it clean.

In the spring of 1895 the Metropolitan Traction Company, intending to lengthen its lines materially, presented to the Commissioner of Public Works a form of rail which, after some slight modification, was adopted. It is shown in Fig 3. Except that the rail should have been 9 in. deep, instead of only 7, this section is possibly the best that has been introduced in this country. There is abundant depth for the wheel flanges, while the curved flange on the rail allows obstructions to pass out easily, and materially aids a narrow-tired carriage wheel in getting out, as, the moment it assumes any angle it is lifted up the curve by the reaction against the nearly vertical sides of the tread.

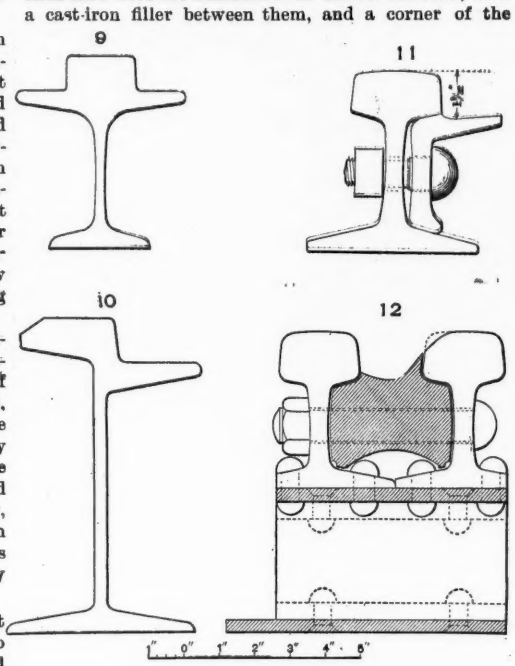
The value of this rail depends on the fact that the slot is so narrow that the wheels of a truck cannot sink into it, and, with the pavement just flush with the tread and flange, there is nothing to keep a wheel on it, so that, not only will there be no difficulty in pulling out of it, but horses will not be constantly reminded by an increase of traction that it is their duty to follow the line of the rail. In fact where this rail has been laid, no wagon with a tire over 1¼ in. wide has been observed by the author to follow it, though when a light wagon is once in it, the horse inclines to follow the rail. This, however results in minimum annoyance to the railroad company, as light vehicles are nearly always prompt to leave the line of rails on the approach of a car. One other form of side-bearing rail (Fig. 10) is shown. This rail has not been laid in the city of New York, though the Commissioner of Public Works was approached by a surface railroad company that wished to lay it. It will be noticed that it is a side-bearing rail, with some of the vices of the Hewitt rail added. Undoubtedly, if its use had been permitted, it would have accomplished its object, namely, the confiscation of about 15 ft. of one of the principal lines of traffic.

Heretofore, where it has been thought necessary to use T rails in the streets of a city, for the passage of either trains or isolated freight cars, the stones have not been paved near the inner side of the rail, but a space of two or three inches between the rails and the stones is left, which often becomes of profound depth. Walter Katte, M. Am. Soc. C. E., Chief Engineer of the New York Central & Hudson River Railroad, devised the compound section shown in Fig. 11. This combination allows the paving blocks to have a side-bearing near their top, on the flange side of the rail, and prevents any wheel which parallels the rail dropping indefinitely between the paving blocks and the rail. The clearance for the wheel flanges, however, is unnecessarily great, as is also the depth for their accommodation, and, on the outside of the rail, the paving block can only be brought in contact with the head of the rail by chipping off a corner, which every one knows is extremely unsatisfactory, as it is almost impossible to keep a paving block in position which has been so treated.



North on the Influence of Rails on Pavements.

When the Central Railroad Company of New Jersey applied to the Commissioner of Public Works of this city for permission to cross Eleventh and Thirteenth avenues near Fifteenth street, with tracks leading from a car ferry landing to its yard west of Eleventh avenue, Mr. J. H. Thompson, its Engineer of Construction, presented a combination shown in Fig. 12. The rails used were the standard 60-lb. rails of the road, with a cast-iron filler between them, and a corner of the guard-rail cut off; the lower flanges of these rails, as shown, are also planed off, and the combination is bolted to a wrought iron chair. This combination, it will be observed, gives a nearly perfect side bearing to the paving blocks, so that they can be laid without chipping, and it is hoped will keep their place rigorously. The cast-iron filler is so formed that, with the planed-off corner of the guard rail, any wheel can get out of the slot with ease. The clearance between the two rails is left as wide as it is because a part of the track is laid on a 16 deg. curve. This is submitted as the best combination yet offered by any railroad company for taking *steam* traffic through the streets of a city.



North on Street Rails.

The rest of Mr. North's paper is a short discussion of the relations of track to paved street. He mentions the great difficulty of fixing the responsibility of street railroad companies for the repair of pavements and of enforcing that responsibility. He says, for instance, that the effort on the part of the city of New York to repair the pavement for which the railroad companies are responsible, and charge the cost of this to the companies, has resulted in bills aggregating much more than $700,000 accumulating against the surface street railroads on Manhattan Island from 1889 to 1895, inclusive. This money has been taken from the resources of the taxpayers, but it does not follow that it has resulted in a like gain to the corporations which so persistently and successfully defy the laws of the state. To this he adds: "It might not be worth while to occupy the attention of the society with this question if it was a local one, but both in cities and on country roads the surface railroads, whether actuated by horse-power or electricity, devastate the highway, using an easement for a right of way on the roads and streets with a haughty disregard of the rights of others that should not be allowed if they were held in fee. In spite of the low freight rates on railroads and water-courses, this country has been injured, and, to some extent, impoverished, through the high cost of transportation on country roads, consequent upon their generally wretched condition. Concurrently with a general effort to so improve the surface of roads and streets that both transportation and circulation shall be cheaper and pleasanter, the success of these efforts are found to be threatened by the legal inability of local authorities to force owners of surface roads to maintain the area within and about their tracks in fair condition."

Another Deep Tunnel for London.

The Metropolitan District Railway in London serves a very important region. It is the line which runs from the Mansion House past Charing Cross and Westminster Bridge and the Victoria Station and so on westward. But notwithstanding the density of the population, or at least of the occupation, of this region there are some reasons why the line is at a disadvantage in competing for short-distance traffic. It runs at such distance from the Strand and Fleet street that people prefer to take the omnibuses. Indeed, those familiar with the consideration of this special class of questions know that it has long been held that a great error was committed in laying out the London underground railroads in that they skirt rather than traverse the region of heaviest business. At any rate, the directors of the Metropolitan District have the embarrassment of seeing their short-distance traffic taken away from them

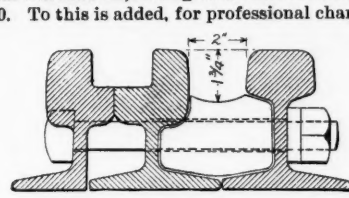
* A paper by Edward P. North, M. Am. Soc. C. E., to be presented before the Society Dec. 16, 1896.

by the omnibuses, and perhaps they look forward to the time when a good deal of their through traffic will be taken by the Central London line now building.

A project is now before them to supplement their line from Earl's Court to the Mansion House, nearly five miles, by a deep tunnel line lying directly under their existing line. Sir Benjamin Baker has recently made a careful study of this project and reported upon it to the Board. The object of course is to quicken the journey from the western part of London and its western suburbs into the heart of the city by means of an auxiliary line on which through express trains can be run without interfering with the trains stopping at intermediate stations.

According to Sir Benjamin's project the new line, going east, would leave the existing line near Earl s Court and drop down, in a distance of about a third of a mile, and by a grade of 126 ft. to the mile, to a depth of about 33 ft. below the present grade. Then a uniform descending grade going east of about 9 ft. to the mile would be maintained to Charing Cross, where would be the only intermediate station. The platform at this station would be 63 ft. below the present District Railway platform, or 78 ft. below the level of the street. Then there would be a short piece of level line, another short piece with a descending grade of 60 ft. to the mile, a little more than half a mile of level and then about a third of a mile of ascending grade of 60 ft. to the mile to the Mansion House station. This would be 71 ft. below the present District line and 95 ft. below the street.

Of course, it is proposed to build this new tunnel line by the means of circular shields, using tubular lining and to work it by electricity. Land damages and easements are supposed to cost comparatively little, inasmuch as the line will go under the existing line, which we suppose, for a considerable part of the way, has an easement to the center of the earth. But, of course, land will have to be acquired for sidings, generating station and other auxiliary purposes. It is estimated that the tunnels and track, including sidings, stations and land damages, will cost one million pounds and that the electrical installation, rolling stock and the like will cost £264,000. To this is added, for professional charges, parliamentary and other expenses and interest, £189,600, making the total cost of the line, five miles long and equipped ready for working, £1,453,000.



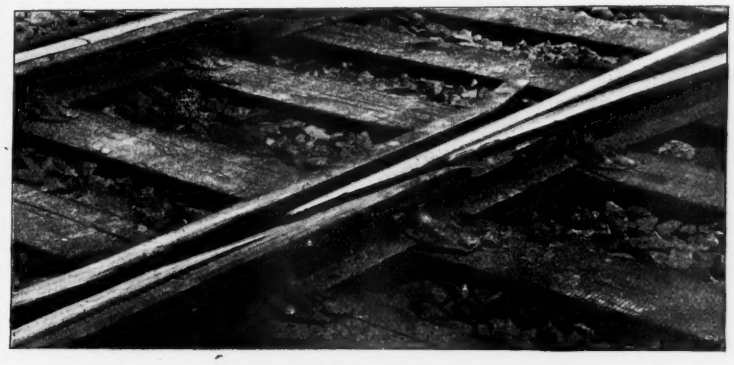
Cross-Section of Tyler-Ellis Frog.

The Tyler-Ellis Frog.

The frog which is shown herewith has been considerably used in England, and has been approved by the Board of Trade. A few frogs have been brought to this country for experimental use, and have been subjected to hard usage with good results. The patents on the process are owned by the Tyler & Ellis Hydraulic Forging Co., of Peterboro, England, who are represented in the United States by Messrs. Murphy & Du Barry, of Philadelphia.

It will be seen that the frog is very simple and that it involves no break in the main line rail, in which a groove or flangeway is pressed at the necessary angle. The crossing rail is grooved in the same manner, and it is afterward bent to lie alongside and bolted to the main rail. The inside rail is bent to act as a wing or guard as in other forms of frogs. It will be noticed that as there is no break in the continuity of the track, the frog becomes the strongest instead of as heretofore the weakest part of the way. The wearing surface is increased, thus avoiding wearing down into a hollow. Better alignment is also obtainable, and derailments are less likely to occur on account of the greater rigidity and the impossibility of the points becoming displaced.

These frogs are made by heating the rail and then placing it in a machine designed especially for the work. The rail is placed between three dies, one of which is stationary and supports one side and half of the base; e second die is moved up to it and supports the other side and the other half of the base. These dies, when closed, allow a third die which is operated by hydraulic pressure to be brought down, slowly forcing the metal into the required form. The metal is not cut away, simply being displaced into the web. The reduction of the height of the rail would seem to indicate weakness, but careful tests have have been made of the pressed portion in comparison with the unpressed rail, and it is found that the heating and the pressing increase the specific gravity to such an extent that the quality of the metal is improved.



The Tyler-Ellis Frog.

The test referred to is as follows:

	Unpressed rail.	Pressed rail.
Breaking strength, tons per square inch...	46	49
Extension per cent. in 8-in. length.....	12	14
Contraction of area, per cent.....	53.6	41.7

The Value of the Steam Jacket on a Locomotive Cylinders.*

Object of Experiment.—The object of this experiment was to ascertain the advantage gained by jacketing the cylinders of a locomotive engine. The trials were undertaken, and carried out on the Lancashire & Yorkshire Railway, at the suggestion of Mr. John A. F. Aspinall, Chief Mechanical Engineer.

Owing to the fact that these trials were carried out on a locomotive doing its ordinary train service, it was impossible to obtain results as complete and thorough as would have been aimed at had the experimenters been able to make the trials on a special train, the working of which could have been arranged to meet the necessities of the experiment. The trials were of short duration, and the condition of the fires at the start and the finish of each had to be determined by the necessities of the traffic requirements, and could not therefore be varied to suit the wishes of the experimenters. The consumption of steam was obtained with a close approach to absolute accuracy; but the same cannot be said respecting the fuel consumption, owing to the above circumstance with regard to the condition of the fires. The results obtained are therefore not such as will enable any definite conclusions to be drawn as to the value of the steam jacket in locomotives.

Description of Engine.—The experiment was made on a passenger locomotive, No. 1,093, during its regular work of taking the 7:30 a. m. express train from Manchester to York, a distance of 76½ miles, and returning with the 3 p. m. express from York to Manchester. Both engine and tender are the ordinary standard pattern of this railroad. The engine is a four-wheeled coupled with bogie truck, the driving wheels being 7 ft. 1 in. diameter. The cylinders are inside and horizontal, with their valve chests on the top. The boiler is of steel, 4 ft. 2 in. diameter and 10 ft. 7⅝ in. long; the firebox shell of steel, and the firebox of copper, 6 ft. long, 4 ft. 1 in. wide, and 5 ft 10 in. high. There are 220 tubes of 1¾ in. outside diameter. The heating surface in the tubes is 1,108.73 sq. ft. and in the firebox 107.68 sq. ft.; total, 1,216.41 sq. ft. The fire grate area is 18.75 sq. ft., the ratio of heating surface to grate area being 65 to 1. The fire brick arch in the combustion chamber is about 2½ ft. long. The height of the chimney above the fire grate level is 10 ft.

*Abstract of the report of the research committee of the Institution of Mechanical Engineers on "The Value of the Steam Jacket," by Prof. T. Hudson Beare and Mr. Bryan Donkin.

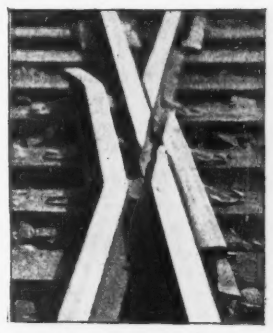
The cylinders were originally of the normal pattern, 19 in. diameter and 26 in. stroke. For this experiment they had been bored out and fitted with cast-iron liners which reduced the internal diameter to 17⅛ in., thus providing a body jacket of ⅝ in. space. The front cylinder heads were fitted with external covers, the space left between forming a steam jacket. The back heads, however, were imperfectly jacketed by fitting over them, as closely as possible, an annular wrought-iron ring with an inner and an outer cover, the space between the latter two forming a jacket space. The external surfaces of the end jackets were much exposed, and not well covered.

The proportion of the clearance surface jacketed is only about a quarter of the whole, and this is mainly due to the cover jackets; of the back ends, therefore, a large part is hardly jacketed at all in the true sense of the word.

Description of Trials.—Four trials were made, lettered A, B, C and D on Sept. 18 and 19, 1794; A unjacketed and B jacketed on the 18th; C jacketed and D unjacketed on the 19th. A and C were made on the runs from Manchester to York, and B and D on the return runs from York to Manchester.

Observations.—In each trial the weights of coal and feed-water consumed were measured, and readings of the various gages were taken and the position of the reversing gear was noted. Indicator diagrams were obtained, and in trials C and D samples of the furnace gases were collected from the smokebox below the exhaust pipe.

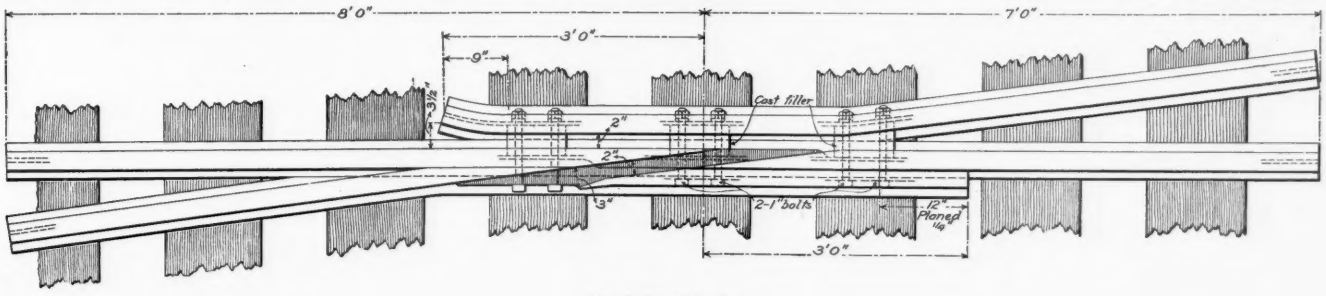
Coal.—The coal used was carefully tested, and its calorific value found to be 14,200 thermal units per pound of day coal, equivalent to an evaporation of 14.7 lbs. of water from and at 212 deg. Fahr. The coal was placed on the tender in sacks holding 200 lbs. each; and the time of emptying each sack upon the footplate was noted, as well as the total weights. An attempt was made to have the fire in the same condition at the end of each run as at the start; but it was difficult to carry out this arrangement, since the trials were made during ordinary runs, and could not be allowed to interfere in any way with the regular working of the traffic. The gradients at the two ends of the journey are different and different fires were therefore needed to ensure adequate steam at the beginning of each run. The ashes and clinkers from the smokebox and firebox were weighed off at the end of each run, but those in the ashpan were weighed only at the end of each double journey. As each trial lasted only about two hours, errors introduced by variation in the condition of the fire might be thought to bear rather a large proportion to the total coal consumption; but, bearing in mind the rapidity of consumption, amounting to about 50 lbs. or 60 lbs. per square feet of grate per hour, this was probably not the case. The actual coal consumption per indicated H. P. per hour of steaming time in the four journeys was respectively 2.87, 3.07, 3.73, and 2.79 lbs.



The Tyler-Ellis Frog.

Furnace Gases and Temperatures.—The gases were collected on the second days' trials only, but no temperatures could be taken, as the thermometer broke immediately after leaving Manchester. The mean results of the three analyses made from the sample collected on each journey are the following volumetric percentages; Trial C, carbonic acid, 12.85 per cent.; oxygen, 4.15; carbonic oxide, 0.80; nitrogen, 82.20. Trial D, carbonic acid, 15.10; oxygen, 1.97; carbonic oxide, 0.85; nitrogen, 82.08 per cent.

Feed-Water.—As arranged by Mr. Aspinall, the feed-water was measured by means of a Siemens water-meter on the pipe between the tender and the injector. It was originally intended to have a means of making direct measurement of the feed-water; but he had not been able to carry out the necessary arrangements. The



The Tyler-Ellis Frog

meter was read at the time of starting from each station, and thus a fair approximation to the rate of consumption was obtained, as well as the total quantity. The overflow from the injector was caught and allowed for. The meter was tested by Professor Beare, after the trials were over, and was found to register 2.6 per cent. too low.

Steam-jacket Water.—The jackets were drained into three small tanks carried upon a temporary staging on the front of the engine; one measurement was made for the two body jackets together, another for the two front covers, and a third for the two back covers. While standing at York on each day radiation tests were made, by measuring the quantity of steam condensed in each pair of jackets with the engine standing, all hot; these lasted 2½ hours on the first day and 1¼ hours on the second. The following were the results obtained:

Condensation of Steam in Jackets, Lbs. per Hour.

	While running.		While standing	
	Sept. 18, B.	Sept. 19, C.	Sept. 18.	Sept. 19.
Two body jackets ...	267	241	35.0	26.7
Two front covers.....	123	103	16.0	13.7
Two back covers.....	65	55	12.0	15.8

Times, Pressures, &c.—The times of passing all the stations were noted, and also the times during which the steam was shut off, in order to determine the actua running time and the actual steaming time in each trial. Whenever a set of indicator diagrams was taken, a note was made of the boiler pressure, of the pressure in the jackets, of the position of the reversing gear, and also of the gradient and mileage.

Indicator Diagrams.—These were taken simultaneously from both ends of each cylinder, the speed in miles per hour being continuously registered by a Boyer speed recorder. If this instrument recorded correctly, the circumference of the driving wheels being known and all slip neglected, the revolutions per minute of the driving wheels can be calculated. An attempt was made to count the revolutions at the time the diagrams were being taken; but it was found impossible to do this correctly at the high speeds.

Tests of Boyer Speed Recorder.—A series of tests of this recorder were made by Mr. Donkin, in October, 1894. There were about 15 tests in all, each of five minutes' duration, during which the mean speed of the engine was taken by the counter, and compared with the mean speed registered by the recorder. The results of the tests showed that at about 15 miles per hour the instrument recorded about 10 per cent. too high, at 40 miles it recorded correctly, and at 60 to 80 miles per hour four per cent. too low. The errors when plotted on a base of speed form a regular curve, from which the following corrections have been taken:

Speed, miles per hour	15	20	25	30	35	40	45	50	55	60	65
Error of recorder, per cent.	10 (too high)	7½	5½	3½	1½	0	1½ (too low)	2½	3½	4	4½

General Results.—Comparing trials A and C, both from Manchester to York, the jacketed trial C showed a consumption of 24.49 lbs. of steam per indicated H.-P. per hour, against 26.70 lbs. for the non-jacketed run A, or a saving of 8.3 per cent. by jacketing. Comparing trials B and D, both from York to Manchester, the figures were 24.48 lbs. and 24.87 lbs. respectively, or a saving of 1.5 per cent. by jacketing. Comparing the figures for coal consumption in trials A and C, the jacketed trial C showed an economy of 0.14 lbs. per H.-P. per hour, or practically 5 per cent., the increased consumption per train mile in this run being accounted for by the greater load hauled; the load was 8 per cent. greater in C than in A, the average speed being nearly the same in both runs. Comparing trials B and D, however, the jacketed trial B was distinctly less economical, the coal consumption being 0.28 lbs. greater per H.-P. per hour than in the non-jacketed trial, or 10 per cent. more; and the consumption was also greater per train mile. In these two trials, while the weight of train hauled was the same, the speed was nearly three miles an hour greater in the non-jacketed run D, with a correspondingly much increased H.-P.

DISCUSSION.

The foregoing paper was read and discussed at a general meeting of the Institution of Mechanical Engineers, on Wednesday, Nov. 4, 1896.

Mr. ASPINALL reminded the meeting that the experiments had been made two years before. The paper was valuable as showing what should be done in making experiments of this nature, rather than in giving actual results. The authors had said that the trials were of short duration and that the condition of the fires at the start and finish of each must be determined by traffic requirements and could not therefore be varied to suit the wishes of the experimenters. Mr. Aspinall did not agree with the views here expressed. He considered that the value of the trials rested in the information they gave as to the value of jacketing, when tested with engines running under average conditions. The surroundings, therefore, ought not to be varied to suit the experimenters, thus affording an exceptional or special result. Mr. Aspinall stated that the figures which were given of the actual coal consumption per indicated H. P. per hour of steaming time in the four journeys could not be accepted as trustworthy, as it was found immediately after the trials that the indicator diagrams showed that there was water in the indicator pipes. Since the trial, experiments had been made to throw light on this point, separate indicators being fixed directly in the cylinder ends. The consequence was that they had obtained larger diagrams, in which the initial pressure had approached more closely the boiler pressure.

Mr. JOHNSON said it would be interesting to know whether Mr. Aspinall intended to alter all his engines by jacketing the cylinders as a consequence of the trials. For his own part he thought the results misleading. It was stated that with the jackets in use the weight of steam per indicated H. P. per hour was 24½ lbs.; without the jackets, 26¾ lbs., but then later on the author stated that the load and speed varied; it was very difficult to get an engine to take a train under uniform conditions on two trials.

Mr. LONGRIDGE said that although the paper might be a record of failure to ascertain facts it was still of value as a record of locomotive performance: that in the present case the differences shown in trials was 10 per cent., but that, he considered, was due to errors of observation; the engines were under the same conditions and there was no reason why the returns should differ. With regard to the boiler efficiency the impossibility of estimating the thickness of the fire remaining on the grate at the end of the run made the results inaccurate. The evaporation was far higher than could be hoped for in a stationary boiler. He thought that the high evaporation recorded was due to priming and was of opinion therefore that if a superheater were put in the smokebox it would be more efficacious than steam-jackets on the cylinders.

Mr. HALPIN remarked that the small tanks collecting water of condensation were above the level of the cylinders, as was shown by the wall diagrams at the meeting. Under these circumstances he did not think that the draining would always be effective, and if the cylinders were water-jacketed in place of being steam-jacketed good results could not be obtained. For jackets to be effective there should be a difference of pressure and temperature between the jacket steam and that in the cylinder. He noticed that in the locomotive in question this had been obtained, but that the element time had not been taken into consideration, and with the very high piston speed on this occasion sufficient time was not allowed for transference of heat from the jacket steam to the cylinder steam.

Mr. ROUNTHWAITE pointed out that there were no records of the temperature of the atmosphere or the force of the wind; also whether it was raining or snowing, or what was the state of the elements generally. It was further to be noted that with the non-jacketed experiments, although steam was not used, the jackets remained there and acted as air jackets; in this respect the cylinders differed from those in an ordinary locomotive, for it was known that the resistance to the transmission of heat was chiefly due to surfaces.

Professor BEARE said that in regard to the condition of the fires at the beginning and end of the runs it was impossible to know the fuel consumption unless the fires were in the same condition at both ends or a correct estimate was made of the difference. That, however, was a most difficult thing to do, for the total error might be very large if the fire were thin at the beginning and thick at the end, or the reverse. He thought that a counter would have been better than a recorder for taking the number of revolutions, and objected to using any instrument which contained an error.

Mr. DONKIN, in speaking upon the criticisms that had been passed on the trials, said that members must remember that the whole of the experimental installation had been given to them. They had to take it as it stood and did their best with the appliances at their command. Some experiments of a similar nature had been made in France on two locomotives of the Paris & Orleans Railroad. The engines were similar, except that one had four Corliss valves and the other the ordinary slide valves. Twenty-four experiments had been made, and it was found that there was a saving of 11 per cent. of steam in favor of the Corliss valve, which he attributed partly to the fact that the Corliss valve gives an arrangement somewhat equivalent to a steam jacket. In regard to using a smoke jacket instead of steam jacketing the cylinders, the experiment had been tried in Italy, and economy had been obtained. In regard to the state of the elements, he thought that his brother experimenters came to the conclusion that it was rather cold, but that accurate observations had been taken and that these could be added to the results already tabulated; any such errors would probably be common to all the observations.

The Life of Railroad Cars with Iron Frames.

A paper in the *Revue Generale des Chemins de Fer*, May, 1896, refers to a number of tests made by Mr. L. Tolmer, for the Eastern Railroad of France, in order to determine the probable life of wagons with frames and bodies either partially or wholly of iron. The wagons submitted to examination were of four types, as follows:

(1) Class L, built about 1861, with wooden under frame and iron upper frame; (2) Class H, built about 1865, with mixed under frame and wooden upper frame; Class L, built about 1865, with mixed underframe and iron upper frame; (3) Class H, built about 1869, with iron under frames and upper frames; Class L, built about 1875 with iron under frames and upper frames; (4) Class U, built about 1874, entirely of iron, with the exception of the flooring.

The loss of weight in the various pieces of eight wagons chosen from the above types may be briefly given as follows:

(1) These wagons, dating from 1861, have had an average length of service of 32 years, and it was found that the ironwork had lost six per cent. of its original weight, due mostly to oxidation. By repairing and renewing, at a cost of about £1 per wagon, their probable length of service is between 30 and 40 years.

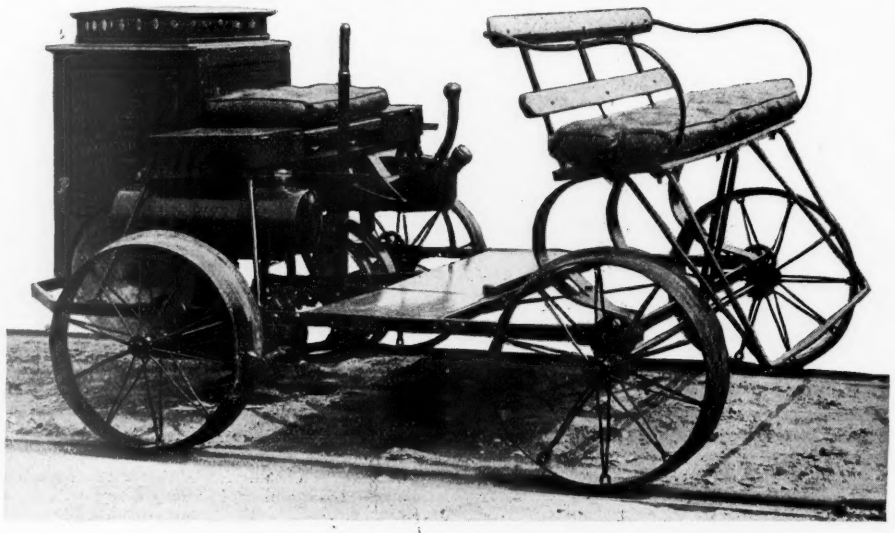
(2) These wagons have had a length of service of from 25 to 30 years. The probable length of service of the iron soles will be from 50 to 60 years, and by renewing certain portions of the upper frame at a cost of about £1, it will last from 35 to 40 years: if the upper frame is then renewed at a cost of about £11, the whole wagon would have a life of from 50 to 60 years.

(3) The principal cause of deterioration in these classes was wearing of the rivets; 50 per cent. of the latter were found to have lost 15 per cent. of their weight and had become loose in their holes. This is probably due to a great extent to hand riveting. The probable length of service by taking precautions in riveting is put down at 50 years, and beyond if particular care is taken to prevent the action of rust. It was found that the paint commenced to wear off at the end of three years of service, and it would therefore seem that in order to prevent rust the wagons should be painted every three years. The cost of this operation, with at least two coats of oxide paint, is estimated at about 14 shillings.

(4) It was found that these wagons, at the end of about 20 years, had lost four per cent. of their weight in the under frames, 12½ per cent. in the light scantlings forming the upper frame (which, in order to preserve the plates, should be renewed about every ten years), and about 35 per cent. of the rivets were faulty.

The examination has particularly shown the difficulty that is encountered in so arranging that the principal pieces forming the wagon shall need repair at the same time. The framework formed of bars of small thickness contributes to the lightness of the wagon, but does not tend to increase its length of service. The later wagons of the Eastern Co. have been built therefore with larger scantlings. It is stated that if these precautions are taken, together with hydraulic riveting and painting every three years, a length of service of from 50 to 60 years may be counted upon.

This brief of the paper is from the "Abstracts of Papers," published by the Institution of Civil Engineers, London.



The Daimler Railroad Inspection Car.

The Daimler Motor Inspection Car.

The accompanying engraving shows a new railroad inspection car, built by the Kalamazoo Railroad Velocipede Co., run by a gas motor built by the Daimler Motor Co. The motor is rated at 2 H. P. and the total weight of the car and motor is 500 lbs. The company estimates that the cost of running averages but two cents an hour.

The motors were formerly made to be operated by gasoline or by illuminating gas, but are now made so that common kerosene oil (petroleum) can be used. This reduces the running expense to a minimum, but affects but little, if at all, the efficiency of the motors. They are designed to run at a high speed and are made from 1 to 25 H. P. For the following description we are indebted to the Daimler Motor Co.:

The base of the motor consists of a cast-iron, gas-tight, circular chamber. In the base are placed two disks, mounted upon the two sections of the main shaft and connected by a crank pin, the disks serving the double purpose of a crank and fly-wheels. In one of the disks is formed a double slip-cam groove, which passes twice around the crank shaft, and returns into itself. In this

cam groove is placed a follower, which operates the valve gear so as to make every alternate stroke a working stroke.

Upon the base are mounted one or more working cylinders, according to the power required. When two cylinders are used, they are either arranged parallel with each other or joined at the base so as to spread out at the top, forming a slight angle. Each cylinder contains a piston furnished with a valve for the transfer of air or gaseous mixture from the base, the valve being provided with a fork by which it is operated. Both the connecting rods of both pistons in the double cylinder engine are received upon the same crank pin. The space in the upper end of the cylinder above the piston is the explosion chamber, with which are connected the inlet and exhaust valves. All the valves used in this engine are of the type known as poppet valves, these having been found in actual practice preferable to sliding or rotating valves. Every alternate stroke of the piston is a working stroke. During the upstroke of the piston, following the working stroke, a preliminary charge of gas and air is drawn into the lower part of the working cylinder, from the crank chamber in the base, as the piston rises. At the same time the upward movement of the piston forces the products of combustion from the explosion chamber through the exhaust valve, which is opened by the slip cam. During the following down-stroke, the air in the cylinder below the piston is forced upwardly into the working part of the cylinder. At the same time a charge of combustible mixture of gas and air is admitted, and the following upstroke of the piston compresses the explosive mixture in the explosion chamber, forcing it out into a capsule, projecting from the inlet valve chest, and when heated by the burner, ignites the explosive mixture, the expansive power of which forces the piston downward. The ignition of the charge is retarded until the crank is on the dead center, by the introduction into the ignition tube of a charge of mixture weaker than that contained in the cylinder. The speed of the engine is controlled by a sensitive governor contained in the pulley, and arranged to intermit the admission of the combustible gas when the speed exceeds the normal. The movements of the piston, when no combustible mixture is introduced, result in simply compressing and recompressing the air contained in the cylinder.

The construction insures a rigid base, which is an important item in a gas engine when the power is developed in the cylinder almost instantaneously. Besides this advantage, the chambered base secures in a very simple way the perfect lubrication of all the working parts, at the same time confining the oil so that it is economized to the fullest extent without being scattered about where it is not wanted.

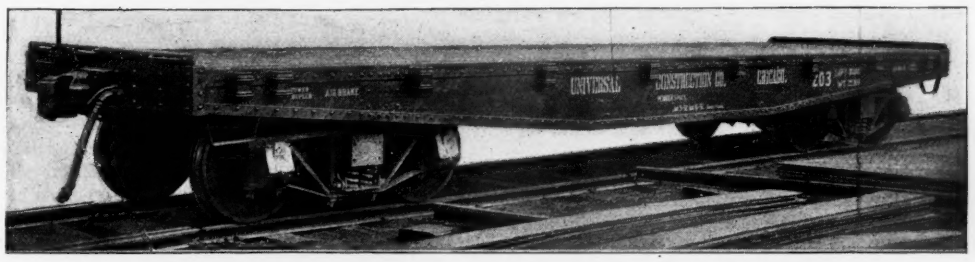


Fig. 1.—Flat Car—Built by the Universal Construction Company, Chicago.

New Steel Cars.

We show by the accompanying engravings two new steel cars built by the Universal Construction Co., of Chicago. In the *Railroad Gazette* of June 12 and July 17, 1896, were shown other steel cars, built by the same company.

Fig. 1 is the latest flat car which differs from the first ones built principally in having greater depth to the side sills between the needle beams. The weight is 25,900 lbs., and the capacity 80,000 lbs. The car can also be used as a gondola.

Fig. 2 shows the underframe for a stock or refrigerator car. It is built up of rolled channels. The method of fastening the wooden floor is shown in the illustration. Wood is inserted between the flanges of the channels and bolted to the webs. To these wooden timbers the flooring is nailed. In the construction of these frames malleable iron castings are used only for stake pockets, while in previous designs malleable iron castings were largely used.

American Society of Mechanical Engineers.—New York Meeting.

The first session of the annual meeting of the American Society of Mechanical Engineers was held at the house of the Society on Tuesday evening, Dec. 1. The meeting was called to order at 9 p. m., and the annual address was delivered by the President, John Fritz, and the fact that he was President and would deliver this address was the occasion of bringing to the meeting an unusual number of the older steelmakers, some of the fathers of the industry in this country being present. Mr. Fritz spoke on the "Progress in the Manufacture of Iron and Steel in America and the Relations of the Engineer to it." He mentioned especially the trials and risks attending the introduction of steelmaking, saying that few people know anything of the labor, the trouble, vexation and disappointment, to say nothing of the physical danger connected with the early stages of the Bessemer industry. The introduction and perfection of this process will for ever remain one of the most interesting and important epochs in the whole history of the iron business. He reviewed briefly the early processes in steel and ironmaking. He then spoke of the Siemens open-hearth furnace, saying that the Siemens principle is truly scientific and yet perfectly simple, and so far is the only method by which the heat can be secured necessary to make steel on the open hearth; and if the users of steel insist on lower phosphorus, it will have to be made on the open-hearth.

Mr. Fritz then reviewed briefly the changes made in machine tools and shop practice, and few men are as qualified as he is to make such a review. His memory of machine shops dates back to 1832, when he haunted the shop of his father, who was a millwright and machinist. He described the early tools with which he became familiar, and as the development of tools and processes run parallel with Mr. Fritz's life, this part of his address was almost a biographical sketch. He said that at Bethlehem they now have lathes which have taken work weighing over 190,000 lbs., and they have planers that have finished castings each weighing 165 tons. Shafts 18 or 20 in. in diameter and 60 to 70 ft. or more in length, lying in V's can be turned easily by one man with a lever 36 in. long, showing the high character of the work.

Mr. Fritz next took up the matter of forging, and said that in his early connection with machinery he discarded forged shafts entirely and substituted cast-iron, melted in an air furnace, and continued to use it until he learned to make and treat steel so as to get it practically solid and free from internal strains. He then described an interesting case of a three-throw crank which he made for a three-cylinder engine, on which occasion he discarded cast iron, which had served him well for 50 years, and used a combination of wrought iron and steel; and he reviewed briefly the introduction of the method of hollow forging.

He gave the results of some physical tests to show the progress that has been made in recent years. A test of puddled bar re-worked car axle gave tensile strength 44,000 to 45,000 lbs, elastic limit 18,000 to 23,000 lbs., elongation 21 to 27 per cent., contraction of area 40 to 48 per cent. He compared with this results from hollow-forged, oil-hardened and annealed nickel steel shafting which give, tensile strength 95,000 to 100,000 lbs, elastic limit 60,000 to 65,000 lbs., elongation 20 to 25 per cent., contraction of area 55 to 60 per cent. In shafts of any size a nickel steel shaft as above would have three times the elastic strength of a wrought iron shaft, and it would be possible to make a nickel steel shaft of one-quarter the weight of a wrought iron shaft and obtain the same elastic or working strength.

"The modern practice of steelmaking has, in the hands of the mechanical engineer, the metallurgist and the chemist, wrought wonders in producing material which in quantity, physical qualities and cheapness would have been regarded as utterly impossible half a century ago. To-day we are enabled to use steel for the commonest purposes as well as for the most expensive articles produced by the skill of the mechanic. No article is too simple to be made of it and no structure so grand and important as to refuse its services."

Mr. Fritz was followed by short addresses by Lieut. William H. Jacques, Mr. Andrew Carnegie, Capt. Robert W. Hunt, Messrs. Robert Forsyth, Samuel T. Wellman and Allan Stirling. The session then adjourned until 10 a. m. on Wednesday.

The annual report of the Council was read at the session on Wednesday morning. Reference was made to the death of past President Mr. J. F. Holloway and to his services to the society and his ability as an engineer. The report shows that the present total membership is 1,762, about 40 having been added during the past year. The Council on invitation of the Superintendent of Buildings of New York City has appointed a committee of three to assist in the revision of the building laws of the city. The committee consists of H. R. Towne, C. W. Hunt and S. W. Baldwin. The Society had also been requested to send a delegate to the National Conference on Standard Electrical Rules and Mr C. J. H. Woodbury, of Boston, was the appointee of the Council. A report of the Finance Committee showed the receipts of the past year to be $29,154, and cash on hand a present, $76.

Sir Henry Bessemer's paper, "A Historical and Technical Sketch of the Origin of the Bessemer Process," was read by Prof. R. H. Thurston. Previous to the reading of the paper, Prof. Thurston presented a communication from Sir Henry Bessemer, in which he stated that it would probably be the last paper which he would prepare for a technical society. This paper evoked a lively discussion. Mr. W. F. Durfee took issue with Mr. Bessemer in regard to the credit due to Mushet and to Mr. Kelly, and to other Americans in the development of the process. He went so far as to claim for the American engineers a large share of the credit of the success of what is commonly known as the Bessemer process. He substantiated his remarks by referring to the history of the process as given in the old records of the technical societies and to his recollections of the development of the process in this country. Mr. Allen Stirling defended Mr. Bessemer's position and was followed by Mr. R. W. Hunt, Mr. Wm. Kent and President John Fritz, who dwelt for the most part on the work done by Mushet and Mr. Kelly. President Fritz stated that, by a careful analysis of the early Bessemer rails which were used in this country, he found that they contained .12 of 1 per cent. of phosphorus.

Other papers presented at the morning session were as follows:

"Ancient Pompeian Boilers," by W. T. Bonner; "Moment of Resistance," by C. K. Kerr; "Work Done by Refrigerating Plant," by F. H. Boyer, and "High-Pressure Steam," by Professor Thurston.

Up to 12 o'clock Wednesday 401 delegates had registered, which is almost double that of any previous year for the first day.

The following are the newly elected officers:

President, Worcester R. Warner, Cleveland, O.; Vice-Presidents, George W. Melville, Washington, D. C.; Chas. H. Manning, Manchester, N. H.; Francis W. Dean, Boston, Mass.; E. S. Cramp, Philadelphia, Pa.; S. T. Wellman, Cleveland, O.; W. F. Durfee, New York City. Managers, John C. Kafer, New York City; Chas. A. Bauer, Springfield, O.; Arthur C. Walworth, Boston, Mass.; Norman C. Stiles, Middletown, Conn.; E. D. Meier, St. Louis, Mo.; George W. Dickie, San Francisco, Cal.; H. S. Haines, Atlanta, Ga: Gus C. Henning, New York City; A. Wells Robinson, Milwaukee, Wis.

Treasurer, Wm. H Wiley, New York City.

Secretary, F. R. Hutton.

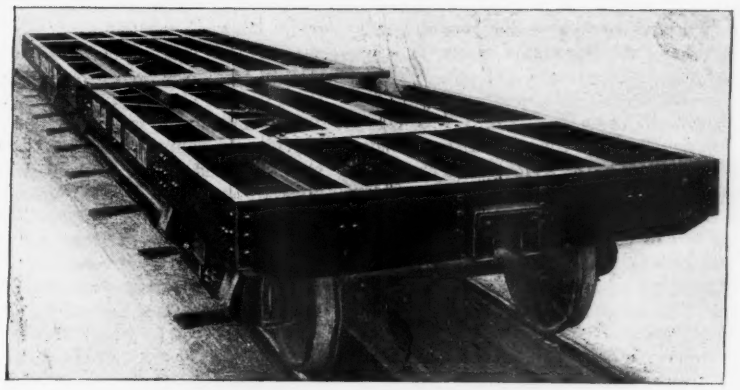


Fig. 2.—Underframe for Stock or Refrigerator Car—Universal Construction Company.

The Simplon Tunnel.

The project for piercing the Simplon tunnel goes forward favorably. The agreement for its execution has been completed between Italy, Switzerland and the concessionary company—the Jura-Simplon. A bill has been introduced into the Italian Parliament to have this agreement ratified. Under this the Italian government grants the Jura-Simplon Company the concession for the construction and operation of a normal-gage railroad across the Simplon from the Italian-Swiss frontier to Iselle. The Italian government undertakes to build the line of approach and have it ready for traffic when the tunnel is ready. The concession is to run 99 years from the opening of the line for traffic. The Italian government gives the company a subvention of $12,738 a year; the gratuitous use on Italian soil of water power for electric lighting or for any other object relative to the building and working of the great tunnel; exemption from duty on all machines and material employed for the building of the tunnel on condition that this material be re-exported at the end of the work. The government preserves the right to buy the concession at the end of 30 years from opening the line. The company is forbidden to transfer the concession to any other interest without the consent of the Italian government.

Armor Plates for the Kentucky.

Thirteen Harveyized nickel steel armor plates, which will be used in the barbette for the United Stated battleship Kentucky, were shipped to San Francisco from Homestead on Nov. 25, on 13 cars specially built for the purpose. Each car contains one armor plate, each of which is 17 in. thick, 10 ft. high and 14 ft. long, weighing 45 tons. The barbette is the largest and heaviest ever built.

RAILROAD GAZETTE

ESTABLISHED IN APRIL, 1856.
Published Every Friday,
At 32 Park Place, New York.

EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

The State Railroad Commissioners, who meet annually in the month of May at Washington, have a committee on uniform classification of freight, and that committee (I. B. Mills, of Minnesota, Chairman) has recently issued a circular to the railroads of the country urging them to adopt a uniform classification. No arguments are offered except those, already well known, which were presented at the convention at Washington last May. It is difficult to see what justification exists at this time for wasting good paper and ink on a circular recommending a renewal of the agitation of this threadbare topic. The difficulties in the way of accomplishing any useful result are just as serious as they were three years or six years ago, and there is no fresh demand for action. On ninety-five per cent. of the commodities which are differently classed in different classifications, any attempt, by committee conferences or otherwise, to make the compromise necessary to produce uniformity would result in a deadlock. The railroad on which the higher rate now prevails would object to a reduction, and the shippers who now enjoy the lower rate would object to having it raised. The fairness of the railroad's objection would, doubtless, be admitted by any reasonable Congressman or Commissioner, for all railroads are now carrying nearly or quite all their freight—certainly all which goes long distances and, therefore, all which is affected by the demand for the unification of classifications—at rates which are so low that they yield but little profit. The objections of shippers must be accepted as fair by every Congressman, whether-or-no; for is not the care of constituents' interests the main business of his life? Thus a uniform classification committee has in prospect simply a long series of deadlocks; nothing else. This being the case, we should suppose that, with Congressmen, the memory of the deadlocks in conference committees at the end of each session of Congress would be sufficient to lead to the rejection of this uniform classification idea unless it shall secure a much more numerous and influential following than it has yet enjoyed. Another hint which ought to be appreciated by Congressmen may be found in the recent demand of the merchants of St. Louis for a change in the rates on freight from that city to points in Texas. After prosecuting their case for a considerable time, it suddenly became apparent that the shippers could not agree among themselves. Some wanted small lots to go as cheaply as carloads, so that they might sell goods at every little hamlet that could boast of a railroad station; but others wanted the carload rates lower than those for small shipments, so as to promote the interests of the wholesalers of Texas—and incidentally of themselves, no doubt.

There is only one legitimate reason for demanding that freight classifications shall be the same throughout the United States, and that is the relief to shippers and to freight office clerks in the clerical work of quoting and calculating prices; and we very much doubt whether the discussion, even on this point, has anything but an "academic" basis. It would not be far out of the way to say that it is promoted mostly by men whose forte is academic discussion. The unification of classifications which took place on the enactment of the Interstate Commerce law in 1887 resulted in a great multitude of reductions in rates, and there is no doubt that, in consequence of this, the movement in favor of uniform classification was at first promoted by interests which in this way simply presented a disguised demand for reduction; but we can hardly believe that a demand of that nature has much strength at the present day. Rates have fallen a good deal during the past eight years, and the knowledge that rates are as low as anyone ought to expect them to be, is much more widespread than formerly. Shippers and tradesmen generally are coming to understand that stability of rates, rather than further cheapening, is the great desideratum at present. To the demand for relief to the clerks who do the work of making bills of lading and estimating the cost of carrying specific shipments, there are two very simple answers. First, the railroads would be making a material reduction in their revenue, out of all proportion to the value of the benefit derived; second, new difficulties would probably arise which would be worse than the old. If the desired uniformity were really attained (on paper) the number of commodity tariffs would certainly be largely increased; and commodity tariffs make as much work as diverse classifications, and probably introduce more perplexity. Every commodity tariff becomes an evil example, leading to the creation of some other commodity tariff, and the increase in number degenerates into indefinite multiplication unless a vigorous restraining hand is applied. The difficulty which the managers of the Joint Traffic Association are now having in their attempt to systematize their classification, by abolishing on April 1, 1897, a great number of unnecessary commodity tariffs, is a good illustration of the obstacles encountered in any attempt to change a classification. When we discussed this subject three years ago (Jan. 12, 1894) the possibility that under the present diversity of classifications the railroads were unwittingly violating the long and short haul law was mentioned in some quarters as one of the reasons for making all classifications alike, but we cannot find that this argument has any basis worth mentioning. Of the numerous complaints made before the Interstate Commerce Commission we do not recall one of any consequence in which this argument was presented.

It appears that the "convention of railroad men' recently held at Chicago to consider proposed legislation, which was so widely advertised in the press dispatches, was a conference of brotherhood leaders, the men present being Messrs. Arthur, Clark, Sargeant, Morrissey and Powell. They discussed three bills which their brotherhoods desire to have passed by the national legislature—the arbitration bill, the contempt bill and the Phillips commission bill. It is said that the five brotherhoods will engage a competent man to go to Washington and watch the progress of these bills in Congress. The arbitration bill is that already introduced by Mr. McGann, of Illinois, which provides for voluntary arbitration, "but a party once having agreed to the arbitration of a dispute must abide by the result." The contempt bill is designed to limit the power of judges to punish persons for contempt of court. It does not change the present law as regards offenses committed in the presence of the court, but in case of an offense committed outside the court-room it is proposed that the accused have the right of trial by jury. The Phillips bill is to provide for the appointment of a commission to study existing laws and the needs of "the masses." It is proposed to have five "labor" men, five business men and five to represent agricultural interests; these fifteen members are to propose new laws or the repeal of old ones. It is probably quite safe to say that the best thing to do with these bills is to throw them all into the waste basket. The brotherhoods and all the rest of us will be better off without them. It is a good thing to have an agent in Washington, if a man of proper discretion can be found, but the most important duty of such an agent would be to kill rather than to make alive. Voluntary arbitration is a self-contradictory term as soon as it gets into the statute books. The principal thing provided for by such laws is the Board of Arbitrators, the manner of selecting these men, or the conditions under which they shall act, being more or less particularly prescribed. But the very first point on which an employer or a company of employees wish to exercise their own volition with the utmost freedom is the personnel of the arbitrating board. In submitting one's vital interests to the decision of a stranger, the two main requirements are that he be a just and impartial man and that he be intimately acquainted with the kind of work which gave rise to the dispute; and on both these points, especially on the first, every individual wants to know *of his own knowledge.* A state arbitrator cannot be well posted on the technicalities of *all* the prominent trades or handicrafts and it is only by occasional good fortune that the appointing power can find men to fill the office whose integrity and wisdom are well known throughout a whole state; certainly it is difficult when the salary is very moderate, as it is in most states.

But if it be admitted that a state commission is useful as an instrumentality for suggesting conciliatory methods in the early stages of labor controversies, and for keeping the public informed of whatever progress is accomplished from year to year in the art of peace-making, the whole matter is a function of the individual states rather than of the Federal government. Everybody who hopes to reform the world by legislation desires, of course, to get the aid of the most powerful legislative body that can be got at; and in this country national organizations very naturally turn to Congress with every grievance. The authors of bills designed to help railroad men are conspicuous examples of this class. They find great satisfaction in phrasing their propositions so that they will apply to men "engaged in interstate commerce." But most railroad men are engaged in intrastate commerce as well as interstate, and they could invoke the aid of the law under one head as well as the other. According to the spirit of our arbitration laws, arbitrators should be invited to act, not force themselves into a controversy; and if railroad men were to invite a public body to do anything for them, they would naturally prefer one near home to one perhaps a thousand miles away. But state intervention in wages disputes is of doubtful value at best. In Massachusetts, where there has been a State Board for 10 years, and where state intervention has probably been as successful as anywhere, the beneficial results are small, and Mr. S. N. D. North, of Boston, Secretary of the National Association of Wool Manufacturers, in a pamphlet recently published, declares that the whole theory is a failure. The Massachusetts Board has, indeed, settled a good many disputes among manufacturers, but Mr. North claims that they were all small affairs. Even if the policy of the state be credited with a modicum of success, it still remains a failure as compared with the remarkable achievements of English artisans in voluntary arbitration, which Mr. North describes.

The "contempt bill" which it is proposed to ask Congress to act upon originated with the agitators who felt aggrieved because Debs was put in jail for contempt of court at Chicago in 1894, and its sponsors deserve no sympathy whatever. The proposition may receive some consideration, however, because, although Debs richly deserved his punishment, there were some conservative critics who thought that Judge Woods acted rather hastily and perhaps made a mistake. The evidence that Debs personally ordered or caused the overt acts against which Judge Woods' injunction had been issued seemed rather shadowy and doubtful, requiring a stretch of the law to admit it as technically valid. But there is no ground for hope that a restriction upon the present power of the judges would improve matters any. Juries make mistakes at least as often as do judges, and the indifferent quality of jurymen's wisdom is a by-word. The judges of our higher courts, by the use of their authority to overrule ignorant or ill-considered action of juries and in the exercise of their other so-called arbitrary powers, have prevented a vast amount of wrong and injustice, and it is a hazardous thing to interfere with prerogatives so long held and generally so well exercised. The courts continue to be our ultimate and strongest safeguard against evils due to temporary causes, and their authority must not be weakened. Every extension of the right of trial by jury increases the flagrant evils classed under the head of "the law's delay." We look upon Judge Woods' error, if he erred, as exceptional. The danger to be apprehended in this direction, if there be any, is that, swayed by the weakening spirit of the times, our judges will be too lenient with wrong-doers, rather than too severe. The proposition for a committee of 15 to suggest new laws and to exercise their ingenuity in jumbling up the old ones, is too crude to merit much notice. It looks like a bald scheme to give jobs to clerks and stenographers and to get the goverment to pay traveling expenses. We would confidentially remind the proposers of the scheme that the standing committees of Congress have the inside track in the race for appropriations of that kind, and are likely to find ways to spend all the money that they will dare to appropriate.

Relative Steam-Making Capacity of Firebox and Tube Surface.

In the correspondence columns will be found some inquiries about the remark made in the *Railroad Gazette* of Oct. 16, to the effect that one square foot

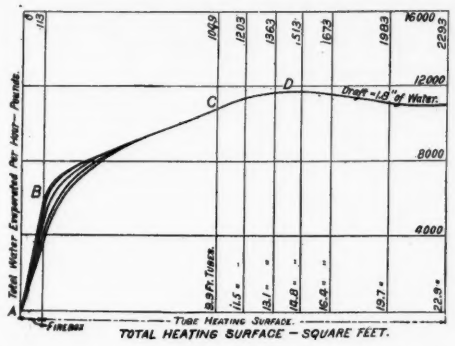


Fig. 1.—Plain Firebox.

of firebox heating surface of a locomotive boiler would make as much steam as ten square feet of average tube-heating surface; also there will be found a general statement of some claims for a firebrick lined firebox which are said to show that a square foot of firebox surface will make no more steam than a square foot of tube surface.

The first matter to be disposed of is the experiments with the brick firebox. The arguments offered are about like this: Two locomotives have the same total heating surface and approximately make about the same amount of steam, in common service. As one has 123 square feet of firebox heating surface, while the other has but 16 square feet, it is concluded that a square foot of firebox surface makes no more steam than a square foot of tube surface under any and all conditions of service. With equal logic one might conclude that if a boiler could be made to run without any firebox heating surface as well under certain conditions as one with such surface, both having the same total heating surface, then firebox surface has no value. This can be shown very easily where the draft is light, as with stationary boilers.

Again, to reason backward with the same sort of bad logic, take the valuable data now available about the steaming capacity of locomotive boilers with short and long tubes under a forced draft; these tests show that very long tubes reduce the maximum capacity of the boiler in a marked degree. Therefore, our logician would conclude that tube surface is of no value, in fact a detriment, and the firebox surface alone makes the steam.

We have in mind good practical boilers, both with and without direct heating surface. These boilers are equal in capacity and efficiency. Most engineers know that long tubes are conducive not only to efficiency but to capacity as well under certain conditions. The error of reasoning is the result of neglect to give some important facts due weight.

One of these facts is that in almost any steam boiler having direct and indirect heating surface, the direct heating surface can generally be removed, when the draft is light, without material loss of total capacity by simply forcing the indirect surface a little harder—that is, making it take up a little more heat per square foot per hour. Such a case is M. Docteur's; his locomotive boiler is not much forced, for locomotive conditions, as can be seen from an examination of the results. European locomotive boilers are not generally forced more than one-third to one-half as

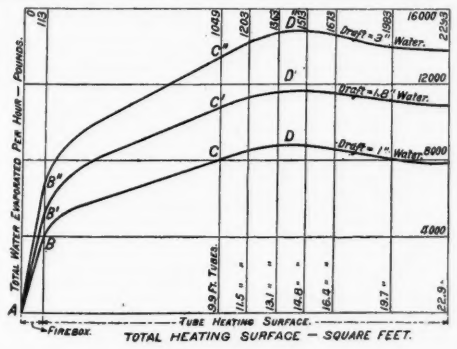

Total Water Evaporated Per Hour — Pounds.
Draft = 3" Water.
Draft = 1.8" Water.
Draft = 1" Water.
Tube Heating Surface.
TOTAL HEATING SURFACE — SQUARE FEET.

Fig. 2.—Plain Firebox.

much as the American, there is, therefore, in M. Docteur's case a chance to force the tubes a little more to make up for the loss of steam in the firebox. The smokebox gets a little hotter, perhaps, but not enough so as to have caused comment. However, take this boiler and put the degree of steam making up to American practice, and there would be little chance of further forcing the tubes, and then a subtraction of firebox surface would result at once in reduced total capacity. Until a locomotive boiler is forced up to the American rate of steam making one may reduce the firebox sorface, the grate, the number or the length of the tubes, with little marked effect in service, but when the American condition is reached each square foot of firebox surface is busy making steam, and likewise all of the rear part of the tubes. The front ends of the tubes are acting as a feed-water heater, and, while doing a large amount of work, are not to be considered as a forced heating surface when compared with the rear ends of the tubes and the firebox. While under these forced conditions a foot cut off from the length of the tubes may increase the maximum capacity of the boiler, because of the freer draft, yet a foot off of the length of the firebox would greatly reduce the capacity.

M. Docteur's results show nothing that was not known before. What seems to surprise some is that when a locomotive boiler is not forced, enough steam can be made with a part brick and part heating surface firebox by increasing the number of tubes and making each of them do a little more work. Under American conditions where a little scale on the firebox sheets causes a marked decrease in the maximum steaming capacity, it is folly to talk of using a brick firebox.

Mr. Dean asks for our authority for the statement that "each square foot of direct-heating surface exposed to the fire will do more work than 10 square feet average of the indirect heating surface, which is mainly made up of the interior of the tubes." Arguments are of little value without facts and endless unless there is a common basis. What is asked of us is to show by some facts why an American locomotive boiler generates about 10 times as much steam on a square foot of firebox surface as on an average square foot of tube surface. One set of facts is all we have space for now. These we will give and ask our correspondent in return for the facts which

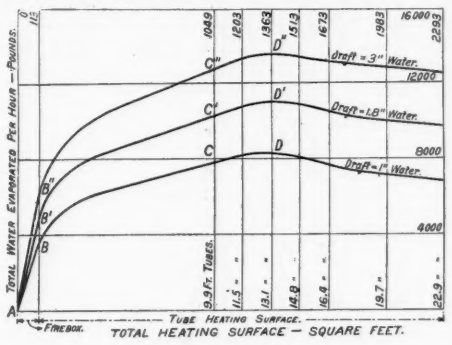

Total Water Evaporated Per Hour — Pounds.
Draft = 3" Water.
Draft = 1.8" Water.
Draft = 1" Water.
Tube Heating Surface.
TOTAL HEATING SURFACE — SQUARE FEET.

Fig. 3.—Long Brick Arch.

make him doubt the 10 to 1 ratio which we have given as a rough approximation.

In this case the most reliable set of data has been given by French engineers; furthermore the less forcing of the boilers under French conditions makes the results more conclusive, for the reason that the more a locomotive boiler is forced the greater is the percentage of the total steam that is made in the firebox up to a point where the firebox surface reaches its limit of steam-making capacity. So if we show evidence based on accurate results and pointing to such a ratio as 10 to 1 for French conditions it will be pretty conclusive for American conditions.

Some years ago the Paris, Lyons & Mediterranean Railroad found it important to know accurately the *best* length of tube to use in locomotive boilers. They must be so short as to give a free action of the smokebox vacuum on the fire at the grate and so long as to give sufficient indirect heating surface to take up most of the heat remaining in the gases after leaving the firebox and to act as a feed-water heater. The engineers of the road knew beforehand, as most engineers have for years past, that the longer the tube, up to a reasonable limit, the greater efficiency of the boiler so far as the extraction of heat is concerned, but where there is great forcing, the long tubes greatly reduce the maximum steaming capacity by reducing the effect of the draft on the fire. What was sought was that length of tube which would give the most steam with a reasonable draft and acceptable efficiency. These experiments were described in the *Railroad Gazette* Nov. 15, 1889, and July 4, 1890.

In the course of the experiments three amounts of draft were used, namely, 1.0, 1.8 and 3 in. of water, this range covering French service conditions. The American range is from 2 to 8 in. in common service. The length of the tubes was varied from 10 to 23 ft. The plain firebox and the long and short brick arch were tried among others. These facts are a sufficient description for our purpose. The most admirable accuracy of the data and the conclusions drawn can be gleaned from the report printed in the *Railroad Gazette*.

The subject under consideration is the capacity of a locomotive boiler under a fixed draft as affected by firebox and tube-heating surface. Now, there is a sort of proof known as the "*reductio ad absurdum*" and this we purpose using. We shall assume that a ratio of 10 to 1 represents the relative steam-making of these surfaces under normal conditions and apply it to the P., L. & M. results and see if it leads to common sense or an adsurdity.

Take the case of the plain firebox and ¼-in. draft, see Fig. 1. This shows that from the point *C*, with 10-ft. tubes to the point *D*, with 13-ft. tubes, the total water evaporated, or the total steam made, increased;

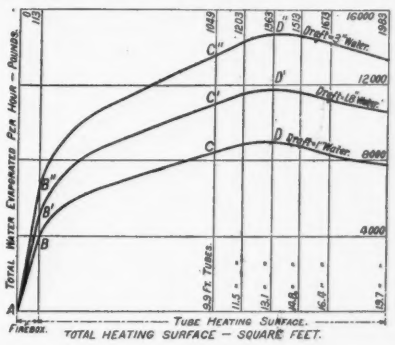

Total Water Evaporated Per Hour — Pounds.
Draft = 3" Water.
Draft = 1.8" Water.
Draft = 1" Water.
Tube Heating Surface.
TOTAL HEATING SURFACE — SQUARE FEET.

Fig. 4.—Short Brick Arch.

with longer tubes it decreased. The experiments ended at *C*. Our study comes between *C* and *B*. Let us take the 13-ft. tube steaming capacity, the maximum, as a basis. There the total steam made in an hour was 11,700 lbs. If each square foot of firebox surface did ten times as much work as each average square foot of tube surface, and the firebox area is 113 sq. ft., and the tube area 1,250 sq. ft., we have only to use a little algebra to learn that the firebox must have given 5,550 lbs. of steam. This gives the point *B* on the diagram. It will be seen that there are several points *B*. This results from taking for this diagram not only the 13-ft. tube as a basis, but all the other tubes as well, so as to furnish the complete story. The line *AB* must be about as drawn, because it must pass through *A* as zero when there is no firebox-heating surface. That is, no steam will be made by firebox surface if there isn't any such surface.

The slope of the curve from *D* to *C* is given by the actual test. The point *B* is located by calculation assuming a ratio of 10 to 1. All know that the slope of the line from *C* to *B* must increase with each foot cut off the tubes, for as the tubes get shorter each reduction has more effect. The first part or firebox end of the tubes, do more steam making than the other end, which acts mainly on American locomotives, as a feed-water heater. Now, if from *C* to *B* there is not an abrupt slope downward to the curve, or if the curve slopes upward or is level, then we have reached an absurdity and the ratio of 10 to 1 is untenable.

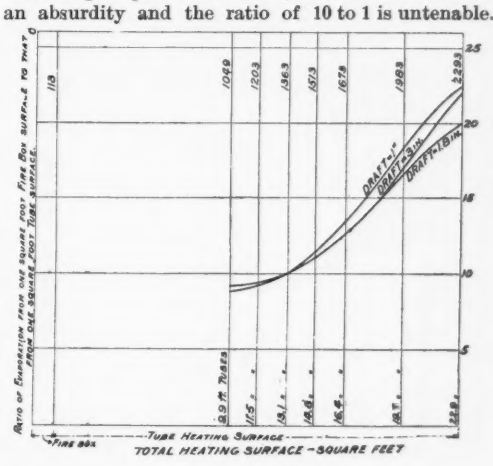

Ratio of Evaporation from one square foot Fire Box surface to that from one sq. foot Tube surface.
Draft = 1"
Draft = 1.8"
Draft = 3"
Tube Heating Surface.
TOTAL HEATING SURFACE — SQUARE FEET.

Fig. 5.—Plain Firebox.

On the other hand, if the slope is considerable and sufficient then that ratio appears reasonable and that is all that is asked until the other fellow shows an equally good basis for a criticism of that ratio.

Now let us examine the slope under the different conditions. The highest point *B* belongs to the shortest tube actually tested, yet even here with but a 10-ft. tube the slope is so abrupt as to indicate that the ratio of 10 to 1 is a fair assumption for even a tube as short as 10 ft. But look at the slope for a 23-ft. tube! It points to a ratio far greater, perhaps 15 to 1, but of this we shall see later.

What this diagram shows is the change in steaming capacity of a locomotive boiler with a constant

draft when the tubes are reduced from 23 ft. in length to 10 ft., and thereafter it shows how the steaming capacity may be affected by a further decrease in tube area. The first part is by actual experiment, the latter part by deduction which appears logical. To simplify the analysis and to further illustrate this matter other diagrams have been prepared taking the maximum steaming capacity of the 13-ft. tube under a draft of 1.8 in. of water as a basis. Such are Fig. 2, plain firebox; Fig. 3, long brick arch, and Fig. 4, short brick arch. Each gives results with three different drafts, and the slope from C to B, C' to B' and C'' to B'' corresponds to a ratio of 10 to 1. This slope is enough to warrant this ratio, or at least warrant one in saying that such a ratio appears reasonable. Taking the curves from the beginning on the left to the end on the right, they appear reasonable in shape and correspond, we believe, with the

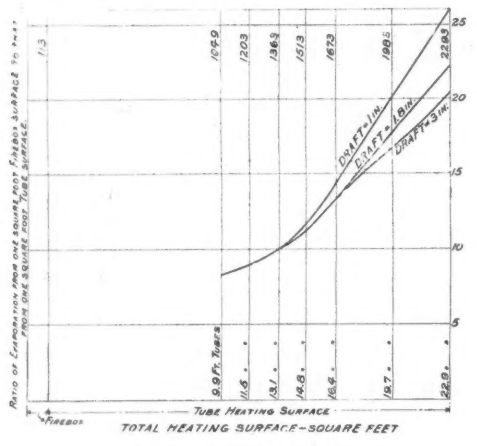


Fig. 6.—Long Brick Arch.

conception of most engineers about the action of firebox tubular boilers when forced. It is seen that the greater the draft the greater the slope, and the more certain does it become that the ratio of 10 to 1 is probably a minimum one for American conditions, where the draft averages nearer 5 in. than the 3 in. which is the maximum of these tests. The proof is more marked with the plain firebox than the brick arches; this again points to an even higher ratio with much American practice where plain fireboxes are forced with 6 to 8 in. draft.

Perhaps the most conclusive and satisfactory of those diagrams are Figs. 5 to 7. These have curves showing the change in the ratio of work done by the firebox and tube surface as the length of the tubes is changed. If not conclusive, these diagrams are at least instructive and exceedingly interesting. They are based on a ratio of 10 to 1 for a 13-ft. tube, this is why the curves all meet at the 10 ratio line and at the 13-ft. tube line. If a ratio of 5 to 1 had been taken as a basis instead of 10, there would have

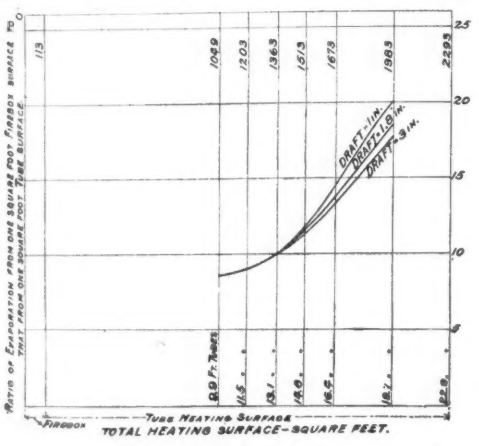


Fig. 7.—Short Brick Arch.

been the same or a similar showing of increase of the ratio as the length of the tubes is increased, and as the draft is higher and more nearly approaches American practice. These curves are based on the results, the only assumption being that when the tubes are 13 feet long a square foot of firebox surface is doing 10 times as much steam making as an average square foot tube surface. Let any one who doubts this ratio take his own basis and the result will be a great increase in the ratio for long tubes and greater forcing just as shown on these diagrams. The highest ratio reached for these curves is about 25 to 1. It is for the long arch, low draft and long tubes. This might be expected, as with such conditions the front ends of the tubes are doing but little steam making, while their area adds materially to the total heating surface of the tubes and decreases the average output.

There is, then, a valuable ratio between the output of the direct and indirect heating surfaces that is well proved by this analysis, and which depends upon the draft and the length of the tubes. Also there is sufficient decrease in the steaming capacity when the tubes are shorter than 10 ft., as shown by the marked slope from C to B, to warrant the ratio of 10 to 1 as an approximation.

Having given some substantial foundation for the statement made in the *Railroad Gazette*, it is now in order for the critic to tell our readers the basis of his criticism. In this way all may have some entertaining reading, and probably there will be a few useful conclusions from the opposing arguments.

The Renaissance of the Narrow Gage.

A favorable law having been passed, the next few years are likely to see the building in England of a considerable number of short railroads for light traffic, and, as we noted last week, different promoters propose different gages for the tracks. We have mentioned the prompt note of warning sounded by the London *Railway World* against the danger of too readily accepting the plausible but unsound arguments offered in favor of narrow gages.

We are glad to see that the *Railway World* is not alone in its advocacy of a wise policy. We quote in another column the words of Mr. Barry, President of the Institution of Civil Engineers, who points out additional facts from the abundant lessons of experience. Among other things he states that calculations made in Ireland some years since showed that by "a liberal estimate" a narrow-gage road could have been built for from $1,500 to $2,500 a mile less than standard gage, which, in Ireland, means 5 ft. 3 in. It seems to us that this estimate is, indeed, very liberal. Two thousand dollars a mile is a very large sum to save on the construction of a railroad merely by making the gage 27 in. narrower. Even with this large saving, say $40,000 on a 20-mile road, the annual interest would barely pay the salary of the Superintendent of an efficient transfer station, leaving the cost of structures, the expense of the actual movement of goods from one car to another, and the delays to cars and goods, as a perpetual burden on the movement of all freight traffic needing to to be transferred from broad to narrow cars, or vice versa.

But how can such a large saving be figured out? Von Weber showed 20 years ago (*Railroad Gazette*, July 12, 1878), that the saving was not over 10 per cent.; and $20,000 per mile is a high figure for the cost of a light railroad which for right of way catches where it can and for grading depends upon good luck. Moreover, Von Weber, though reaching a conclusion which condemned the narrow gage, admitted arguments in its favor which in justice should have been denied. Reporting not only the results of his own experience, and his investigations conducted about that time, but also the decided conclusions of the engineers of narrow-gage railroads in Sweden and Norway, reached five and ten years before that, Von Weber, with a scrupulous desire to be more than fair to the weaker side gave the narrow-gage advocates considerable credit for saving in construction by their ability to run cars and engines around sharper curves than would be practicable with standard-gage vehicles. This he characterized as the chief economic advantage of the narrow gage. But the strength of that argument lay chiefly in the exclusive use on European roads of long rigid wheel bases. With swiveling trucks, and the consequent very short rigid wheel bases, universal in America, and now widely used in England, the narrow gage has practically no advantage in its curves. The Manhattan (elevated) Railroad of New York City, with 4 ft. 8½-in. gage, runs 1,200 trains daily around curves of 90-ft. radius. The problem of getting a light train around a sharp curve depends more upon the stability of the cars than upon their resistance to the tractive power of the locomotive, and stability depends upon width.

The cost of building a narrow-gage railroad, that is, the construction of the embankments and the excavation of the cuts, has been found by experience to be seldom as much as 10 per cent. less than the cost of the same work on a standard-gage road, and the Swedish engineers testified that this saving would disappear if a standard-gage road could be built with curves as sharp as 1,300 ft. radius, a radius now common. The Festiniog Railroad, in Wales, the track of which is only 2-ft. gage, has a roadbed 9 ft. 10 in. wide, and numerous light rail roads of standard gage have roadbeds only 10 ft. 10 in. wide. The bearing surface of the sleepers must be calculated, not by the size of the cars, but by their weight, and therefore the ties must be as long for a narrow-gage vehicle as for a standard gage of the same weight. A simple calculation will show that the weight of the axles, the transverse framing and the brake-beams of narrow-gage trucks will be so little less than those of a standard-gage truck that the difference would amount to less than 4 per cent. of the total weight of a car. This would be only about one or two per cent. of the weight of the car loaded. Finally, inquiry of locomotive builders will show that for engines of the same capacity the price will be but very slightly different for a narrow-gage engine from that for one with standard-gage wheels. All these arguments apply everywhere; with the special conditions found in England to-day there are other important considerations, which are cogently presented in our quotation from Mr. Barry.

For several weeks past the Baltimore & Ohio has taken an unusually large share of the eastbound freight traffic out of Chicago. The weekly reports since Sept. 1 show that this road has taken an average of 11⅛ per cent. of all the eastbound freight (excluding live stock) as compared with an average of 6⅛ per cent. during the same weeks in 1895. Seeing these figures, Western newspapers have freely charged that the road was making secret reductions in rates. One of them went so far as to assert that the receivers of the Baltimore & Ohio had definitely withdrawn from the Joint Traffic Association. As the Western reporters have constantly endeavored to discredit this association ever since it was formed, and as they are constantly looking for some shadow of evidence that its members are dissatisfied and intend to break it up, this wish is probably to be regarded as the father to the thought expressed in the present predictions concerning the action of the Baltimore & Ohio. Receiver Murray has made a very explicit denial. He says:

"It is true that the road is getting a large share of this eastbound tonnage, larger in fact than ever before in its history. But I can very readily understand it; the road is in better financial shape than it was some time ago. The traffic department has its agents through the West. I want to deny most emphatically that this business comes on account of cut rates. We are making no effort to secure business other than legitimately and above board. Our views as to the value and benefit of the Joint Traffic Association to this and other roads are such as would and do make it desirable to cordially support and approve their work. Their conservative action since their organization has done more to maintain rates and preserve revenue than all the machinery that has in the past been used, and we are not by any means going to inaugurate any policy that is in conflict with them, or imperil our own revenues by depriving the company of the benefit of their good counsel and advice, which would be the case should we withdraw from the organization. We are not only going to continue our membership in the Joint Traffic Association, but are beyond that anxious for holding up its integrity and extending its influence and scope."

The Baltimore & Ohio has increased its stock of freight cars since the receivers took charge, and Mr. Murray says that the organization of the freight department has been improved. The New York *Times* this week reports an interview with Mr. Hayden, Chairman of the Joint Traffic Managers, who does not seem to be at all exercised over the reports from the West about the alleged unruly action of the Baltimore & Ohio. He says:

"I do not apprehend that the association is in any danger. The terms of the agreement bind the parties to it for a period of five years, and I have not heard that any road desires to withdraw. We have clearly prescribed means of enforcing our rules, and as yet no order of the board has been disregarded. Our rules provide for the imposition of penalties for offenses proved against any member, but as yet we have not found it necessary to impose any penalties. The Board of Managers is constantly considering complaints, some of a general and some of a specific nature. Probably two-thirds of the applications for relief thus far considered by the board were in relation to the operation of special, or commodity, rates, which were filed by the different lines prior to the exercise of authority by the Joint Traffic Managers. These commodity rate schedules will expire on March 31, 1897, and applications for their renewal will be acted on by the board, which now has power to decide as to the advisability of their renewal. The association has accomplished much good. It has held the trunk lines together throughout a very dull business period. Rates have been fairly maintained in the face of the light traffic of the past year, and the unusual competition at Galveston and New Orleans. Had it not been for the Joint Traffic agreement the railroads would long before this have been scrambling for business, and getting little or nothing in the way of compensation."

Mr. Hayden says that the Managers hope to make arrangements to have some of their work done by committees, so as to economize the time of the full board.

The gates on the passenger cars of the Chicago & Alton evidently must be looked upon as a well-settled institution, though petty criticism continues to be heard now and then from a few drummers and other persons whose railroad rides seem to be costing them more than formerly. A criticism of this kind appeared recently in a Southern paper, stating that a certain large road, acting on the lesson of the alleged unsatisfactory experience of the Alton, regarded the gates as unpopular and would not adopt them. We inquired of the officers of the Alton in regard to the truth of this, and they reply that their satisfaction with the gates is greater than ever. They have not only put gates on every passenger train, but have them as well on passenger cars attached to freight trains. The primary object in using the gates was to put a more efficient check on the collection of tickets and to make careless passengers buy tickets; but the longer the gates are used the more thoroughly do the officers believe in them simply as a preventive of accidents. The statistics of accidents happening to passengers while getting on and off cars in motion show a marked diminution in number since the gates were put on. On the cars lately equipped the gates are flush with the side of the car and reach to the lower step, so that passengers do not even attempt to board a train after it has started. The increase in earnings on the Alton in consequence of the employment of gatemen on trains has been mentioned before. Not only does every passenger have to get a ticket, but the tickets are closely limited as to time and are cancelled when the passenger enters the train, so that the failure of the conductor to find and take up all tickets—which failure is, in some cases, inevitable—is by

no means so serious a matter as it is under the ordinary practice. A minor advantage of the gates, and of the examination of tickets when passengers enter, is the prevention of mistakes by passengers. In this respect every station on the Alton is as well equipped as are terminal stations in large cities, where station gatemen are regularly employed. The Southern Pacific, which began using gates in Texas about a year ago, is now using them, we understand, on the entire line through to the Pacific Coast. The Missouri, Kansas & Texas has them on a few passenger trains and intends to put on more; and four large Western roads have made arrangements to apply them within a few months.

Engineering in its issue of Nov. 13 devotes a page to the discussion of a project for the formation of a "museum illustrative of all matters connected with railways." It is said that there is a movement in the air to establish such a museum, and it is suggested that there are two sources from which the money might come for this purpose, the government and the railroad companies. The editor seems to incline to the notion that the railroad companies will be much more likely to supply the money than the government. Surely if there is any country in the world which should have a railroad museum it is England, where the steam railroad began, and where we may perhaps say it has reached its highest development. This last statement is, however, a little dangerous for an American journal to make, and we only advance the idea tentatively. From what we hear we judge that the railroad branch of the Field Columbian Museum at Chicago is not promising very much for the future, and we fear that its development will be neglected. The Smithsonian Institution has made a very excellent collection illustrative of the development of transportation systems, and particularly of the development of the railroads; but we suppose that England could furnish a volume and variety of historical material which could not be collected in any other country, and the time when it would be possible to collect this material into a museum is rapidly passing, as relics are being scattered and destroyed.

TECHNICAL

Manufacturing and Business.

The Chicago Pneumatic Tool Co., owing to the large increase in its business, has taken larger offices, and is now located in the Monadnock Block, Chicago, rooms Nos. 634, 635 and 636.

On Wednesday last the Sargent Company's works, corner Fifty-ninth and Wallace streets, Chicago, were inspected by Mr. F Obana, Engineer of the Imperial Steel Works of Japan, and several other Japanese engineers, who were accompanied by the Chief Engineer of the Northwestern Elevated Railway. After witnessing a pouring of a heat of open-hearth steel, they adjourned to the laboratory and saw a series of tests made on castings, made for the Wells Street Bridge under contract with the Northwestern Elevated Railway, and some excellent qualities were developed; tensile strength being 71,800 lbs.; elongation in two inches 35.5 per cent.; reduction in area, 43.01 per cent.

The Louisville, New Albany & Chicago is to equip such of its cars as are not now equipped with M. C. B. couplers with the Trojan coupler. An order for brakes has been placed with the New York Air Brake Co., and the shops at Lafayette are to be run on full time, employing 500 men, to equip the cars with brakes and couplers.

The grain doors and security lock brackets manufactured by the Chicago Grain Door Co., Chicago, have been specified on the 1,000 cars just ordered by the Illinois Central.

A coal-conveying plant is being installed by Heyl & Patterson, of Pittsburgh, for the Schoenberger Steel Co., which will have a capacity of 75 tons a day.

A list of those classes of securities known on the Stock Exchange as unlisted and inactive is issued by Mr. F. J. Lisman, of 30 Broad street, New York City. This list was first issued about 18 months ago, and has come to be a valuable guide to the market value of many securities, for which it has been difficult to get a reliable quotation. The list gives the amount outstanding, the rate of interest, and in what month payable, with the date of maturity and a bid and asked price for each security, thus putting in a convenient and accessible form information which formerly the average investor found difficulty in obtaining. Mr. Lisman has made the value of these securities a special study for some years, and is well qualified to prepare this list.

New Stations and Shops.

The Louisville & Nashville is to build a new freight-house on Front street, in East St. Louis, near the landing of the Wiggins Ferry Co. The site was decided upon by the officers this week and work will begin probably before the end of December.

The contract has been awarded for erecting a new car repair shop for the Baltimore & Ohio, at Keyser, W. Va. The contractor is J. A. Liller, of Keyser. A building 80 ft. × 420 ft. will be built, at a cost of about $7,000.

Iron and Steel.

The Edgar Thompson Steel Works of the Carnegie Company, at Braddock, Pa., were closed on Nov. 30 for an indefinite period, throwing 5,000 men out of employment.

The Pottstown Iron Co., of Pottstown, Pa., has started one of its puddle mills and two rolling mills. Preparations are being made for further resumption within a short time.

The Franklin Steel Casting Co., of Pittsburgh, Pa., has shipped to New York, to go to Russia, a plunger weighing 33,000 lbs. The company is making two large castings for the United States Navy Department at Washington, one of which is soon to be tested by the Government. If the test is successful 10 more will be finished.

Several blast furnaces are being blown in in the Shenango and Mahoning valleys. Those already started are one at Briar Hill, three at Newcastle, one at Lowell, one at Struthers, three at Youngstown and several at Sharpsville and Sharon.

The Bethlehem Iron Co. on Nov. 25 shipped gun material and plates weighing over 33 tons to the United States Navy Yard at Portsmouth, Va.

The Ohio Steel Co. started its plant at Youngstown, O., on Nov. 30, and it is expected will run steadily until the holidays. It is said that an order has been received by the company for 15,000 tons of steel billets, which will be used in making wire nails.

Car Lighting.

A contract has been signed between the Manhattan Railway Co. and the Safety Car Heating and Lighting Co. for equipping the cars of the former with Pintsch gas. The Manhattan Company has 1,122 cars in service. Mr. George Gould, President of the Manhattan, is reported to have said that the work is to be pushed as fast as possible.

River and Harbor Improvements Tributary to Philadelphia.

In the annual report of the chief of engineers for 1896, Major Raymond gives a detailed account of the work done and now doing in improving the Delaware River and Bay, and near-by waters. The total amount spent on the Delaware from 1836 to June 30, 1896, was $2,326,392, of which $119,243 was spent on that part of the river between Trenton and the upper part of Philadelphia. It is believed that there is now no place in the main ship channel between Bridesburg and deep water in the bay where there is a less depth than before beginning these improvements, and there is a greater depth for about 10 miles, or about one-half of the whole obstructed part of the channel. The total domestic freight movement on the river in 1890 was 8,433,276 tons, as against 14,322,346 tons in 1895; but only a part of this large increase can be attributed to the improvement of the river, as most of the freight is carried in vessels of moderate draft. The total value of the freight moved on the river in 1895 is estimated at $480,346,656. In the harbor between Philadelphia and Camden, N. J., where the many small islands formed a considerable obstruction in the channel and prevented the extension of wharves, the amount expended up to June 30, 1895, was $1,617,340. During the fiscal year ending June 30, 1896, 4,488,737 cu. yds. of material was dredged from Smith and Petty islands, and much work was done on the water fronts. Up to June 30, 1896, five piers had been completed up to the new lines, and three others were under way. The foreign freight movement of the port of Philadelphia in 1895 was 3,094,369 tons, and the domestic freight movement, 14,322,346 tons.

In the Schuylkill River the channel at the entrance, which in 1870 was only 10 ft. deep at mean low water, has been increased to twice that depth and been widened to 150 ft. During the fiscal year ending June 30, 1896, much dike work was done, at an expense of $21,431. The city of Philadelphia is now further improving the channel. The commerce of the Schuylkill consists principally of the transportation of petroleum oil and grain, and requires vessels of deep draft.

In Delaware Bay, near Lewes, Del., an iron pier 1,700 ft. long has been built, extending from the south shore of the breakwater into the bay to a depth of 22 ft. at mean low water. The work was begun in 1871, and completed, except the superstructure, in 1880. The amount spent to June 30, 1890, was $368,454. The right to use this pier for railroad purposes, granted in an act of July 15, 1870, has never been exercised, as the pier would not support the weight of modern freight engines. Much other work, but of minor importance, has been done on the harbors and water fronts in this district.

Twin-Screw Savannah Steamship.

A short account was given in the *Railroad Gazette* last week of the new Plant Line steamship La Grand Duchesse, built at the Newport News shipyard for the run between New York and Savannah. The new boat is 5,018 gross tons burden, contains 152 state rooms and has a capacity for 700 passengers, 569 being first cabin. The hull is of steel. The engines are quadruple expansion, with cylinders 24 in. × 36 in. × 48 in. × 68 in. diameters, by 3 ft. 6 in. stroke. There are eight Babcock & Wilcox boilers, each 42 in. diameter, with an allowable steam pressure of 225 lbs. The vessel is built entirely of steel, to be available for use as a Government cruiser in case of emergency. It is equipped with every device for the safety and comfort of passengers.

Heilmann Locomotives for Russia.

The French and German newspapers say that the Russian Ministry of Ways and Communications intends to hire four electric locomotives of the Heilmann system. Two of them will be required to haul a train of 418.9 tons at a speed of 65.8 miles an hour. The other two will be designed for freight service and will be required to make a speed of 26.1 miles an hour with a train of 1,102.3 tons. The rental for the passenger engines will be 13.10 cts. and for the freight locomotive 15.14 cts. per mile run.

A Decision for the Link-Belt Machinery Company.

In the recent suit brought by the Link-Belt Machinery Company against the Jeffrey Manufacturing Company, Judge Sage, of the United States Circuit Court, has decided (Oct. 29) that the Jeffrey Manufacturing Company had infringed the patents covering chain mining machines and the defendants were enjoined from making movable frame, chain, breast mining machines, with holding device, and were ordered to pay to the Link-Belt Machinery Company the profits of past sales, damages for infringement and the costs of the complainant in the suit.

The Q & C Brake-Shoe Key.

We illustrate herewith a pressed steel brake-shoe key which has been known as the "Drexel," and is now made and sold by the Q & C Company. These keys conform to the M. C. B. standard, are made of the best material and are of uniform strength through out. According to the claims made by the company they are much lighter and cost less than the forged keys.

Duncker's Apparatus for the Measurement of Moisture in Steam.

The *Zeitschrift für Hygiene* describes this apparatus, by which it is affirmed that it is possible to indicate the existence of actually dry steam at a temperature of 100 deg. C. in the middle of closely-packed bundles of linen, bedding, etc., undergoing disinfection. The more recent form of the instrument consists essentially of short lengths of catgut, prepared in such a way that they will only contract to the necessary extent in dry steam of known temperature, and thereby close an electrical circuit and give an alarm signal. Two qualities of catgut filaments are prepared, first, such as will act after exposure for four or five minutes to dry saturated steam at a temperature of 99 deg. to 100 deg. C., and secondly, those which will act only when exposed for a similar interval to dry steam at 102 deg. to 103 deg. C. It is stated that if this instrument was really possessed of these properties it would afford a most valuable means of control in cases of disinfection, but the experiments of Sander and Clarenbach, given in the *Minutes of Proceedings Inst. C. E.*, Vol. CXVI., and those of Dräer, do not confirm the claims put forward by the inventor.

An outline is given of the various experiments needed to set at rest this question. The tests were carried out in a special apparatus, and the various points were investigated in detail. The results obtained are summed up as follows: Though considerable variations occur in the size of the fibers, these do not to any serious extent interfere with the accurate registration of the instrument. Three principal causes conspire to hinder the true working of the apparatus: A premature signal may be given by a false contact between the slide holding the filament and the metal frame of the instrument, or the hygroscopic fiber may be affected by moisture, or, lastly, the points of contact may become coated with oxide and thus delay the signal. Damp, moist air at a temperature of from 80 deg. to 95 deg. C. may cause the filament to contract and close the circuit. It was also found that a signal may be given before the instrument has been exposed for several minutes to saturated steam, freed from air, and at a temperature of 99 deg. to 100 deg. It was possible to obtain complete, effectual disinfection, *i. e.*, the destruction of certain specified bacteria, before the apparatus gave any signal whatever that the requisite temperature had been reached. The contact thermometer showed itself in all cases to be more reliable than the instrument for determining the moisture present in the steam.

THE SCRAP HEAP.

Notes.

The statement published in certain daily papers that the Maine Central has put cylometers on its locomotives has no substantial foundation. A single one was used, for one trip, chiefly as a curiosity; that was all.

The Pennsylvania Railroad has filed a bill in equity in the Philadelphia Common Pleas Court against the Philadelphia & Reading Railroad and Coal and Iron companies, the new Philadelphia & Reading, the National Company, and others, to recover damages for the non-performance of the contract of June, 1887, under which the Reading was to deliver annually 1,000,000 tons of coal to the Pennsylvania.

A track foreman of a prominent Western road has been discharged for attempting to bribe an officer of the company. He offered the Division Engineer half the proceeds if the engineer would see that he got the first prize at the annual inspection of track. The matter was referred to the Superintendent, who patiently reasoned with the foreman; but the latter could not be made to see his error, and indeed intimated that the Superintendent was not using him fairly. So then he was discharged.

The Houston & Texas Central has appointed a watch inspector, with subordinates at the principal points, and employees have been ordered to have their watches ex-

amined *every month.* Men who do not have their watches repaired by the official inspectors will have to pay a fee of $1 a year for the inspection. The official inspectors will keep a watch in order for $3 a year provided it does not need more than $15 worth of work done upon it in any one year.

The Austin, Tex., *Statesman* reports a test of the "dustless passenger car" of the Texas Midland, recently described in the *Railroad Gazette* (Oct. 23, page 788). Forty men took a trip in the car, with the windows all locked down. The ventilators were put in perfect condition, and every man lighted a cigar of the poorest quality to be found in Texas. The volume of cigar smoke was "enormous." Moreover, the engineman was instructed to kick up as much dust as possible; but the air in the car remained agreeable from the first to the last.

It appears that the regulations of the Post Office Department concerning the transmission of railroad letters in baggage cars without stamps are still unsatisfactory and a number of railroad officers had a conference with Mr. Neilson at Washington last week. The Assistant Attorney-General for the Post Office Department has had this question under consideration, and it is reported that he holds that letters passing over two or more railroads do not come within the exemption prescribed in the rules of the Post Office Department; in other words, that letters of this kind must be enclosed in stamped envelopes.

Grain Elevators on Railroad Land.

The Supreme Court of the United States has announced its decision on the appeal of the Missouri Pacific Railway from the decree of the Supreme Court of Nebraska, directing the railroad company, at the request of the State Board of Transportation, to permit a party of farmers to erect a grain elevator on its right of way, and itself to construct a track thereto. The case was docketed in the Supreme Court of the United States Oct. 3, 1890, and was argued at the last term. The opinion says it is not a question affecting rates of transportation, not an order compelling the railroad company to erect an elevator, nor a matter effecting equal rights of access to the property from the outside, but a demand that, simply for the convenience of the petitioners, they be permitted to build the elevator on the property of the railroad company. "This the court are unanimously of the opinion is the taking of private property for private use without the due process of law, and therefore in violation of the plain terms oi the Constitution." The judgment of the State Court was reversed and the cause remanded with instructions to proceed in conformity with the opinion.

Pneumatic Tubes for Conveying Mails.

The proposed tubes between the post offices of New York City and Brooklyn, to be laid on the East River Bridge and underground for the short distances to the post offices at either end, seem to be now assured, a press dispatch from Washington, Nov. 27, stating that Assistant Postmaster General Neilson had signed a contract with the New York Mail & Transportation Co. for their construction. There are to be two tubes, each 8 in. in diameter, inside. Mr. Neilson has also contracted for similar tubes in Philadelphia, to connect the General Post Office with the stations of the Pennsylvania and the Philadelphia & Reading railroads.

The Mayor and Aldermen of the City of Boston have contracted with the Boston Pneumatic Transit Co. to lay pneumatic tubes in certain streets of that city. The tube company is pay the city a percentage of its receipts, rising from ½ of one per cent. the first year to 2½ per cent. annually after nine years.

Uniforms for Freight Trainmen.

Freight brakemen and conductors on the Chicago & Eastern Illinois Railroad are now uniformed in seal-brown corduroy suits. The order to this effect includes all freight trainmen on the line from Chicago to Danville. The new uniform in style and cut will be somewhat similar to that adopted for the switchmen of the Western Indiana road some time ago, with the exception that the coats will be longer. Conductors and brakemen will wear the same color, but the former's uniforms will be adorned with gold buttons, whereas the brakemen will have to be content with plain silver buttons. A Chicago paper, from which we copy this item, says that the men "are highly pleased at the innovation." They are a unit in the opinion that they don't know anything that will match the color of plain, ordinary freight, with a few oil cars mixed in, better than seal-brown corduroy. They are rushing their tailors in order to get the seal-brown corduroy suits ready in season (Dec. 1). Rumor has it that another company, immediately spring opens, will attire its freight brakemen in corduroy suits of a pale violet color, with knickerbocker breeches, and distinguish conductors from brakemen by different bright-hued ribbons tied at the knee.

Boxing and Shipping a Vessel.

At Lewis Nixon's shipyard, Elizabeth, N. J., a vessel is being boxed for shipment in separate pieces to South America. The vessel has been built for use on the Magdalena River in the United States of Colombia. Her length is 100 ft.; beam, 22 ft.; depth, 7 ft., and she carries 100 tons of cargo on 3 ft. draught. She is propelled by independent side wheels driven by compound engines. Her speed will be 11 miles an hour.

The Renaissance of the Canal.

"Speed and certainty of supply and delivery of goods means less money employed by the trader, a quicker turn over of capital, and often the gain or retention of a market in consequence of such advantages. I cannot but think that many persons who so often advocate the renovation of inland canals, and who hope for some great and radical benefits to trade or agriculture us a result, lose sight of these necessities of certainty and speed in modern trading; and for myself I have little confidence in a mode of transit which is slow, deficient in power of convenient distribution, and necessarily uncertain, as largely depending on rainfall, and liable to be entirely deranged by prolonged frost.

"In this connection I do not wish to be understood that my remarks apply to inland ship canals, though even here the results hitherto realized are very disappointing, or to special localities where warehouses have been built in former years alongside inland canals, and where those warehouses also have railway accommodation. In such places there may be and there does exist a considerable traffic on canals. But these I think are exceptional cases, and do not affect the main proposition that a means of communication which is slow and liable to interruption cannot compete with railways, and ought not to be fostered with the hope of benefit to the population at large. Better far than reconstructing inland canals would be the spending of money in improvements of railway facilities and in the lowering of railway rates, provided it be done without injusitce to those who, in reliance on the good faith of Parliament, have risked and spent their money in that present system of railway intercommunication which has been proved to be an unmixed good to the whole country.' — *Mr. John Wolfe Barry, President Institution of Civil Engineers.*

Heavy Snows in North Dakota.

For three days in the latter part of last week a severe storm swept over Minnesota and the Dakotas, causing some loss of human life and considerable loss of live stock. Trains were stalled in many places, and those which were able to get through were much delayed. On Saturday the Division Superintendent of the Railroad Mail Service at St. Paul, Minn., reported that the through trains on the Northern Pacific and Great Northern lines would be delayed at least forty-eight hours. The principal trouble is in North Dakota.

Extension of a Central American Railroad.

Recent advices from Salvador announce the completion of the railroad line from the port of Acajutla to Santa Ana, the commercial metropolis of the country. Until recently the road reached only as far as Ateo. The work of extension was begun in 1892 by Mr. A. J. Sherzer, under a contract with the government, and the occasion of its completion and public inauguration was celebrated with much official ceremony. The line is 3-ft gage and is equipped with 54½-lb steel rails. It is understood that the work of building the branch line to San Salvador, the national capital, has been undertaken by Mr. Sherzer, to be completed by next June.

The French-Soudan Railroad.

We are informed by *Le Journal des Transports* that the Colonial Minister of France is seriously considering finishing the railroad from Kayes to Bafoulabe and to the Niger. Money has been voted since 1884 for the maintenance of this road, but it is said that this money has really had to be spent for rebuilding. According to the official report of 1896 thirteen million francs was spent from 1881 to 1884 in building the railroad without any useful result whatever. The work simply consisted in laying down 90 kilometers of rails on ties spaced more than five meters apart, these rails being held in place by single bolts. Surveys have now been finished as far as the Niger, and the project for finishing the railroad and carrying it on to the Niger has been favorably considered by the Colonial Minister. It has seemed to us from the first that the building of this railroad is a simple waste of human energy unless we regard it purely as a philanthropic enterprise, and it is a pity that either governments or individuals should be led by enthusiasts to put their money into railroads in such unprofitable countries under false notions of the profits to be derived.

LOCOMOTIVE BUILDING.

The Schenectady Locomotive Works are building for the Northern Pacific, four mastodon, or 12-wheel compound locomotives, which will be the most powerful engines of this type ever built. The engines are of the Schenectady two-cylinder compound type, the high pressure cylinder being 23 in. and the low pressure 34 in. in diameter, with a stroke of 30 in. The cylinders are fitted with the new intercepting valve, designed by the Schenectady Locomotive Works, which enables the engine to be operated as simple or compound at will. The weight of the engine will be about 180,000 lbs., with 148,000 lbs. on drivers. The driving wheel centers are of cast steel, 48 in. in diameter, which with 3½ in. tire makes the diameter of drivers 55 in. The boiler is of the extended wagon-top type, 72 in. in diameter at front end, has a larger heating surface than ever used in locomotive practice, and is built to carry a working pressure of 200 lbs.

CAR BUILDING.

The Bristol, Elizabethton & North Carolina road, which is owned in North Carolina, is likely to order new rolling stock shortly.

The Illinois Central contract for 1,000 new cars referred to several weeks ago was awarded last week, the order being divided equally between the Wells & French Car Co., of Chicago, and the Pullman Car Co.

The Canadian Pacific carshops at Perth, Ont., are now engaged in building 200 grain cars. The shops are turning out these cars at the rate of five a day. The cars are each 35 ft. long, 9 ft. wide, 8 ft. high and of 60,000 lbs. capacity.

The Mobile & Ohio has ordered 25 refrigerator cars of 60,000 lbs. capacity from the Mt. Vernon (Ill.) Car Mfg. Co. These cars will be equipped with the New York air brake, Gold couplers, Detroit Steel & Spring Co.'s springs, galvanized iron roof and the Carson & Gurganus improved refrigerator doors.

The Ohio Falls Car Mfg. Co., at Jeffersonville, Ind., has received an order from the Deming, Sierra Madre & Pacific road, in Mexco, for 150 box cars, seven passenger coaches, a private car and three cabooses. In consequence of this order and other orders received from roads in the United States, the car works resumed operations on Dec. 1.

The new Baltimore & Ohio cars referred to a week or two ago are for the Fairport Warehouse and Elevator Co., one of the lines operating over the Baltimore & Ohio Railroad. The matter, as previously stated, has not yet been definitely decided upon, but the cars if ordered will be built under the Baltimore & Ohio specifications for box cars, and will be similar to those built for the railroad company itself last spring.

BRIDGE BUILDING.

Boonville, Mo.—Committees have been appointed to raise stock for the proposed wagon and motor-car bridge across the Missouri River at this place, plans for which have been approved by the Secretary of War. The estimated cost of the bridge is about $200,000.

Cedar Creek, Neb.—This place has voted $4,000 bonds for a bridge over the Platte River.

Charlotte, N. C.—The Glendon & Gulf, now extending its line, will build two or more iron bridges and contract for considerable trestle work on the line.

Cincinnati, O.—It is stated that the County Commissioners have instructed County Engineer Frank S. Krug to prepare plans and specifications for an iron bridge over the Miami River at Cleves. The cost of the bridge is not to exceed $1,200, and it will be begun at once.

Danville, Pa.—The viewers of the Catawissa River bridge have recommended the erection of an iron structure.

Denver, Col.—The Paonia Bridge Co. has been incorporated by T. C. Wand and others to build a bridge across the North Fork of the Gunnison River, in Delta County. The capital stock is $6,000.

Detroit, Mich.—According to the order made on May 8 last, the bill for the erection of a bridge across the Detroit River at this place is made the special order on the U. S. Senate calender for the first Monday in December, the opening day of the session.

Eganville, Ont.—The Fourth Chute bridge near this village has been condemned and Mr. J. L. Morris, C. E., recommends the building of an iron bridge in place thereof, at a cost of $1,500.

Elkton, Va.—An iron bridge, to cost $7,500, will be built over the Shenandoah River at this place.

Indianapolis, Ind.—Bids were received as follows for the superstructure of the proposed bridge over White River at Harding street: Attica Bridge Co., $25,500; Bellefontaine Bridge & Iron Co., $26,585; B. L. Blair & Co., $28,000; C. D. Browder, $17,890; Canton Bridge Co., $25,200; Champion Bridge Co., $24,900; Chicago Bridge Co., $24,300; M. M. Defrees, $24,971; C. F. Hunt Co., $24,000; Indiana Bridge Co., $24,801; Lafayette Bridge Co., $24,025; Massillon Bridge Co., $26,999; Penn Bridge Co., $24,740; M. Steinhauer, $17,557; Toledo Bridge Co., $23,920; Variety Iron Works, $25,490; Wabash Bridge Co., $24,900; Wrought Iron Bridge Co., $26,280

Knoxville, Tenn.—Knox County bridge bonds to the amount of $215,000 have been sold to N. W. Harris & Co., of Chicago. It is stated that in view of the fact that the bonds are now sold, the Youngstown Bridge Co., which has the contract to build the bridge, will at once begin work on the piers, which, it is hoped, will be completed and ready for the superstructure by the opening of spring.

Madison, Wis.—It is probable that the Wisconsin Central will build a new drawbridge across the Menasha Canal this winter.

Medina, N. Y.—It has been decided that a new steel bridge over Oak Orchard Creek will have to be built, and the Highway Commissioners have taken action in the matter.

Montreal, Que.—The City Council has passed a resolution to request the Dominion Government to rebuild the McGee's bridge across the Lachine Canal, to accomodate the heavy traffic of that locality.

The City Council will build a steel bridge at Mountain street over the Grand Trunk tracks; probable cost, $107,000, half paid by the railroad company.

New York.—The New York and New Jersey Bridge Construction companies have made a contract with the Union Bridge Co. for building the bridge over the Hudson River at a cost not to exceed $25,000,000. Secretary Swann says: "We shall soon be ready to offer the bonds to financiers." We trust that the careless reader will not assume that the work of construction is to be immediately begun.

North Yakima, Wash.—High water has carried away a span of the iron railroad bridge over the Natchez one mile north of this city, built five years ago.

Ottawa, Ont.—The Department of Railways and Canals will let contracts for eight small bridges along the Trent Valley Canal.

Pittsburg, Pa.—Nov. 27, the Special Committee of Councils appointed to inquire into the condition of the bridges on South Highland, Penn and Shady avenues, which it is proposed to rebuild, visited the bridges, and it is thought the improvements will not cost over $5,000 per bridge. The ordinance providing for the reconstruction of the bridges will be before Councils for final action at the next meeting. Under its provisions the bridges will have to be remodeled at an expense of about $20,000, $14,000 to be paid by the city and $6,000 by the Consolidated Traction Coompany, whose tracks cross them.

Portage la Prairie, Man.—The Town Council will build a new steel bridge across the new bay to the island, costing $5,000.

Riviere du Loup, Que.—The local government will rebuild the bridge over the Riviere du Loup in the parish of St. George.

St. Charles, Mo.—Mr. Theodore Bruere, President of the St. Charles & St. Louis Bridge Co., has called a meeting of the stockholders for the purpose of arriving at definite plans for securing the improvement. A charter was granted the company by the last Congress for a highway bridge over the Missouri River at this point, and it is the intention of the promotors to get everything in readiness for the building of the structure next spring.

Severn Bridge, Ont.—The contract for the steel bridge across the Severn at this place has been awarded to the Central Bridge Co. of Peterboro, for $5,500. The bridge will consist of three spans of 70 ft. each.

Terre Haute, Ind.—The Edge Moor Bridge Works, Wilmington, Del., will build two bridges on the Vandalia Line, one over West Mill Creek, west of Marshall, on main line, between here and St. Louis—two plate-girder spans, each about 68 ft. long; the other over Little Wabash, near Effingham, also on main line—one deck span 133 ft. 10½ in. c-c end pins, and two plate-girders about 68 ft. long.

Toronto, Ont.—The County Engineer has recommended that the wooden bridge at York Mills be replaced by a stone and iron structure 220 ft. in length by 18 ft. wide.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

In the Federal Court it is held that a contract by which a railroad arranges with another to the exclusion of still others, for the interchange of passengers and freight by through tickets and bills of lading, is not a contract in unlawful restraint of trade, within the meaning of the act of July 2, 1890.[1]

In Kentucky the court rules that the statute provid-

ing that, if any railroad shall charge or collect more than a just and reasonable rate of toll for the transportation of passengers or freight, it shall be guilty of extortion, and fixing a penalty therefor, is void for uncertainty, in that it fails to prescribe a standard as to what is just and reasonable, by which the carrier can regulate its conduct.[2]

In Tennessee it is held that the statute requiring every railroad company to keep a person on each locomotive on the lookout ahead, and to sound the alarm whistle and apply the brakes whenever any animal or other obstruction appears on the track, applies to a freight train running at full speed through the grounds of a station at which it does not stop.[3]

In the Federal Court it is laid down that in determining the question whether a difference in rates between points of shipment involves an unjust discrimination or an undue preference by a railroad company, it is error for the interstate commerce commission to reach its conclusion solely by contrasting the distance of such places, respectively, from the starting point, or upon a mileage basis, without taking into account the existence of competitive rates to one of such places.[4]

In Pennsylvania it is held that an injunction will issue to prevent a railroad company from charging a greater rate for transportation of freight a shorter distance than is charged for its transportation in the same direction to a more distant station.[5]

In Missouri the Circuit Court of St. Louis decides that a railroad is obliged to receive a passenger's bicycle as "baggage" without the payment of additional fare beyond the price of his ticket, and that *mandamus* to compel the railroad to carry the wheel will lie as well as an action for damage for refusing to carry.[6]

Injuries to Passengers, Employees and Strangers.

In Massachusetts evidence that a conductor of defendant's electric car allowed a switch stick which he was using from the top of the car to free the trolley to fall from his hands and injure a bystander, with evidence of a prior binding of the trolley at the same place, warrants a finding of negligence in the adjustment of the overhead wires.[7]

In the Federal Court it is laid down that it is sufficient to charge a railroad with knowledge of the incompetency of an employee, that notice of such incompetency should be given to those officers of the company who supervise such employee's work, and are given authority to suspend him temporarily from his position, for incompetency of the kind in question, and it cannot be required that notice of such incompetency should be brought home to those superior officers of the company who alone are entitled finally to discharge the employee.[8]

In Indiana a child, playing on the right of way of a railroad, where it is crossed by a public highway, is not a trespasser.[9]

In Iowa it is laid down that an engineer of a train following a hand car propelled by sectionmen familiar with the running of trains has a right to suppose that they knew the train was approaching, and is bound to use all the efforts to stop the engine only when it appears to him that they are not aware of the approach of the train and are not likely to leave the track in time to allow it to pass.[10]

In Illinois, as a matter of law, it is not negligence for a person, having a return ticket good only on a certain train, to get upon the platform of a car, where he did not know, when he came to take the train, that it was so crowded that he could not get inside the car.[11]

In Maryland it is decided that a contract insuring a carrier of passengers against liability for injuries to passengers is not void as against public policy in that it relieves the carrier of his duties to the public or lessens his liability for negligence.[12]

In Wisconsin the yard foreman of a terminal switching company operating over 40 miles of track and 70 switches, whose duty required him to aid in and superintend the switching, seeing none of the crew on the approaching switch train went between the cars to make a coupling when they were 3 ft. apart, and still in motion and fell over a pile of ashes on the track. The ashes were partially covered by snow and ice, and the day was dark and sleet was falling. The Supreme Court rules that the foreman was not, as a matter of law, guilty of contributory negligence.[13]

In New York in an action for injuries received by plaintiff, a brakeman, while coupling cars to a yard engine, plaintiff testified that he was standing on the footboard of the engine, and, as he reached over to set the coupling pin, he was blinded by steam which came out of the relief valve and the cylinder, and that his hand was caught between the bumpers. There was some evidence that the steam leaked from the engine, but to what extent, or from what cause, did not appear. Plaintiff testified that, though he had worked with the engine about four hours the day of the accident, he did not know that it leaked steam. Evidence was given on behalf of defendant that it did not leak steam any more than engines in perfect condition. The Supreme Court says that a verdict for plaintiff was based on conjecture, inasmuch as it left it to the jury to measure the quantity of steam issuing from the valve, and that escaping from the cylinder.[14]

By the statutes of Texas four requisites are given in section 2 to constitute co-employees fellow-servants: They must (1) be engaged in the common service; (2) in the same grade of employment; (3) working together at the same time and place, and (4) to a common purpose. The Supreme Court holds that an engineer and a switchman, who were members of the same switching crew, engaged in switching cars under a common foreman, were fellow-servants, although employed and discharged by different superiors.

The Supreme Court of the United States holds that the employees of an extra freight train are the fellow-servants of section hands going to their work upon a hand car, so that the negligence of the former in failing to give proper signals, whereby a collision results, does not render the company liable for injuries to one of the section men.[16]

In Indiana to push a car backward over a public crossing, without any watchman on the end of the car, and without ringing the engine bell as required by statute, is negligence on the part of the railroad company.[17]

In Texas it is held that where a railroad voluntarily constructed a bridge over ditches along its right of way as a private way for the use and convenience of the occupants of the land abutting on its right of way, it was liable, to one of the parties for whose use it was built, for injuries caused by its failure to keep the bridge in proper repair.[18]

In New York it is ruled that knowledge of the motorman that a man was not employed by the company to place sand upon the track to prevent the car from slipping on the incline, does not necessarily show an assumption of the risk resulting from the neglect to employ such employee, as the motorman may not have had knowledge of the need of such an employee.[19]

In Iowa a railroad is not liable for any negligence of its surgeon, employed by it to treat gratuitously its injured employees, in causing an injured employee to be moved from one place to another.[20]

In Wisconsin the failure of a railroad to remove a bank of earth on its right of way, consisting almost entirely of a natural hill through the base of which the track was laid in a cut, and which obstructed the view of an approaching train from travelers on the highway, was not a failure to restore the highway to its former state of usefulness, as required by statute.[21]

In New Hampshire there was evidence that at the time there was a cattle train in defendant's yard, standing across a footpath, at a place where animals were sometimes loaded and unloaded; that plaintiff went to such train, and got on a car to see some cattle for which he was negotiating; that on the track last crossed by him, six or eight rods from him, was a locomotive; that, as the train was about starting, plaintiff got off the car, stepped back, and, while standing there, was struck and injured by such locomotive; that the fireman was absent from the locomotive; and that no signal was given. The Supreme Court rules that the fact, if true, that the engineer of such locomotive was ignorant of the existence and use of such pathway, would not relieve defendant of liability, if no signal was given, and plaintiff was free from contributory negligence.[22]

In Texas, where a railroad obstructs a public road crossing by unnecessarily leaving cars standing in such a manner as to frighten teams of ordinary docility, it is chargeable with negligence.[23]

In Louisiana it is laid down that where a person, instead of taking a highway to his destination, walks over a cinder path between railroad tracks, though by implied permission of the company, and is killed by a train, but not by the wantonness or malice of the company's employees, no recovery can be had for his death.[24]

[1] P. & A. C. v. A., T. & S. F. (C. C.). 73 Fed. Rep., 438.
[2] L. & N. v. Com., 35 S. W. Rep., 129.
[3] M. & O. v. House, 35 S. W. Rep., 561.
[4] I. C. Com. v. L. & N., 73 Fed. Rep., 409.
[5] C. I. W. v. Penn., 5 Pa. Dist. R., 247.
[6] State v. Mo. Pac., 43 Cent. L. J., 377.
[7] Manning v. West End, 44 N. E. Rep., 135.
[8] B. & O. v. Hentborne, 73 Fed. Rep., 634.
[9] Kremzer v. P., C., C. & St. L. Sup., 43 N. E. Rep., 649.
[10] Nelling v. C., St. P. & K. C., 67 N. W. Rep., 404.
[11] C. & A. v. Dumser, 43 N. E. Rep., 698.
[12] B. & A. v. Mercantile Trust, 34 Atl. Rep., 778.
[13] Kennedy v. L. S. T., 66 N. W. Rep., 1,137.
[14] Hone v. F. R. C. (Sup.), 38 N. Y. S., 1040.
[15] G. C. & S. F. v Warner, 35 S. W. Rep. 364.
[16] Nor. Pac. v. Charless, 16 S. Ct. Rep., 848.
[17] L. S. & M. S. v. Boyts, 43 N. E. Rep., 667.
[18] Hall v. T. & P., 35 S. W. Rep., 321.
[19] Windover v. Troy City Ry., 38 N. Y. S., 591.
[20] York v. C. M. & St. P., 67 N. W. Rep., 574.
[21] Leitch v. C. & N. W., 67 N. W. Rep., 21.
[22] Mitchell v. B. & M., 34 Atl. Rep.
[23] M., K. & T. v. Jones, 35 S. W. Rep., 322.
[24] Settoon v. T. & P., 19 South., 759.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Delaware & Hudson Canal, quarterly, 1¾ per cent., payable Dec. 15.
Northeastern, (*S. C.*), 3 per cent., payable Jan. 1.
Philadelphia, Wilmington & Baltimore, 4 per cent., payable Jan. 2.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Rome, Watertown & Ogdensburg, annual, Central Trust Co., New York, Dec. 28.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Railway Signalling Club* will meet on the second Tuesday of the months of January, March, May, September and November, in Chicago.

The *Western Railway Club* meets in Chicago on the third Tuesday of each month, at 2 p. m.

The *New York Railroad Club* meets at 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Tuesday of each month.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, N. Y., on the second Friday of January, March, May, September and November, at 2 p. m.

The *Southern and Southwestern Railway Club* meets at the Kimball House, Atlanta, Ga., on the third Thursday in January, April, August and November.

The *Northwestern Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, at 8 p. m.

The *Northwestern Track and Bridge Association* meets at the St. Paul Union Station on the Friday following the second Wednesday of March, June, September and December, at 2.30 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month, at 8 p. m.

The *Western Society of Engineers* meets in its rooms on the first Wednesday of each month, at 8 p. m., to hear reports, and for the reading and discussion of papers. The headquarters of the Society are at 1736-1739 Monadnock Block, Chicago.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m., except during July and August.

The *Denver Society of Civil Engineers* meets at 3 Jacobson Block, Denver, Col., on the second Tuesday of each month except during July and August.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday, at 8 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month, at 7.30 p. m. Address P. O. Box 333.

The *Engineers' and Architects' Club of Louisville* meets in the Norton Building, Fourth avenue and Jefferson street, on the second Thursday each month at 8 p. m.

The *Western Foundrymen's Association* meets in the Great Northern Hotel, Chicago, on the third Wednesday of each month. S. T. Johnston, Monadnock Block, Chicago, is secretary.

The *Engineers' Club of Columbus*, (*O.*), meets at 12½ North High street, on the first and third Saturdays from September to June.

The *Engineers' and Architects' Association of Southern California* meets each third Wednesday of the month in the Hall of the Chamber of Commerce, Los Angeles, Cal.

The *Engineers' Society of Western New York* holds regular meetings the first Monday in each month, except in the months of July and August, at the Buffalo Library Building.

The *Civil Engineers' Society of St. Paul* meets on the first Monday of each month, except June, July, August and September.

The *Engineers' Society of Western New York* meets on the first Monday of each month at the Society's rooms in the Buffalo Library.

The *Boston Society of Civil Engineers* meets at 715 Tremont Temple, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Engineers' Club of St. Louis* meets in the Missouri Historical Society Building, corner Sixteenth street and Lucas place, St. Louis, on the first and third Wednesdays in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Engineers' Society of Western Pennsylvania* meets at 410 Penn avenue, Pittsburgh, Pa., on the third Tuesday in each month, at 7:30 p. m.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Association of Engineers of Virginia* holds informal meetings on the third Wednesday of each month from September to May, inclusive, at 710 Terry Building, Roanoke, at 8 p. m.

Southern and Southwestern Railway Club.

At the recent annual meeting of the club, officers were elected as follows: W. H. Thomas, Superintendent of Motive Power of the Southern, President; W. H. Hudson, First Vice-President; John Cook, Second Vice-President; R. E. Libbe, Treasurer; S. A. Charpiot, Secretary.

Montana Society of Civil Engineers.

The November meeting of the society was held on Nov. 13, in Helena, Mont.. The report of Prof. Ryon on Senate bill No. 2301 which provides for the establishment of engineering experimental stations in each state, was read and adopted. Mr. Blackford read a paper entitled "A Few Short Points Observed in a Short Trip Abroad."

National Association of Manufacturers.

The date for holding the second annual convention of the National Association of Manufacturers has been fixed for the 26th, 27th and 28th of January, 1897, at Philadelphia, Pa. It is expected that this convention will be one of unusual interest, as the President will submit a report of the first full year of practical work in the lines mapped out by the original convention held in Cincinnati, January, 1895.

Western Society of Engineers.

A regular meeting of the Western Society of Engineers was held in the rooms of the Society, Monadnock Block, Chicago, Wednesday evening, Dec. 2. The papers presented at this meeting were: "The Equipment of Manufacturing Establishments with Electric Motors and Electric Distribution," by Mr. D. C. Jackson, and "Electric Traction," by Mr. Edward Barrington. Officers were elected for the ensuing year.

A Brooklyn Engineering Society.

A meeting was held recently at 149 Pierrepont street, Brooklyn, N. Y., to form an engineers' and architects' association in that city. Twenty engineers and architects were enrolled as charter members. A committee, consisting of A. J. Provost, William G. Ford, Walter Meserole, A. J. Caldwell and George W. Wilson, was appointed to draw up a constitution and by-laws, and as soon as this is done the association will be incorporated and officers elected.

Convention of the M. C. B. Association.

The thirty-first annual convention of the Master Car Builders' Association will be held at Old Point Comfort, Va., commencing on Tuesday, June 8, 1897. Headquarters will be at Hotel Chamberlain, which has made rates from $3 a day to $5. Members of the association will hav preference of rooms at Hotel Chamberlain until March 1, 1897. Applications should be made to Geo. W. Swett, Manager, Hotel Chamberlain, before that date in order to be sure of such accommodations. The Hygeia Hotel, which is directly across the street from Hotel Chamberlain, has made the same schedule of rates and the same general terms. Parties wishing to secure rooms at this hotel should make application to F. N. Pike, Manager Hygeia Hotel. Messrs. S. A. Crone and R. H. Soule constitute a joint committee of arrangements.

PERSONAL.

—Mr. Charles S Pease, General Baggage Agent of the Delaware & Hudson Canal Co., died Dec. 1 at his home, Albany, N. Y., of apoplexy.

—The office of Chief Engineer of the Norfolk & Western road, for many years held by Mr. W. W. Coe, is reported to have been abolished.

—Capt. A. E. Hatchfield, President and General Manager of the Oconee & Western Railroad, in Georgia, died at Hawkinsville, Ga., on Thursday, Nov. 19.

—Mr. James McCrea, Jr., a son of Vice-President McCrea, has been appointed Engineer of Maintenance of Way of the Indianapolis & Vincennes Division of the Pennsylvania lines.

—Mr. Paul J. F. Groth, formerly with the Milwaukee, Lake Shore & Western, in Milwaukee, has been appointed Chief Rate Clerk in the General Passenger Department, Chicago & Northwestern, at Chicago.

—Mr. H. C. Eckenberger has resigned as Assistant General Agent of the Burlington route, in Portland, Ore., and Henry W. Goddard has been appointed to the position. Mr. Goddard has for 17 years been in the general freight department of the Southern Pacific Co

—Mr. Screven Dozier, acting Treasurer of the Florida Central & Peninsular Railroad, has been appointed Treasurer of the road, the appointment to take effect Dec. 1. The position was made vacant by the death of Mr. W. N. Thompson in September last.

—Mr. John L. Ferguson, Chicago Passenger Agent of the Chicago & Northwestern, has been appointed Assistant General Passenger Agent of the same company with jurisdiction over its local traffic, and William M. Dodd has been made City Passenger Agent to succeed him.

—Mr. H. C. White, of the Phœnix Iron Works Co., of Phœnixville, Pa., has been elected to succeed Prof. W. T. McGruder as Chief of Machinery of the Tennessee Centennial Exposition. Mr. White is a graduate of Stevens Institute, and has had 16 years of practical experience in engineering work.

—Mr. Leander J. Buckley, for many years Purchasing Agent of the Baltimore & Ohio, has resigned to go into other business in Philadelphia. He has been succeeded by Mr. E. H. Bankard, who has been Chief Clerk to Mr. O. G. Murray, Vice-President and Receiver of the line, and held a similar position when Mr. Orland Smith was Vice-President of the company.

—Mr. William Steinway, a Rapid Transit Commissioner of New York City, one of the most public spirited citizens of New York, and identified for years in almost innumerable ways with its commercial and charitable affairs, died at his home last week. The appointment of his successor as a member of the commission will make a majority of the members of the board new men. Two vacancies were filled only a week or two ago. The board has five members.

—Mr. J. D. Hawks has been elected President of the Detroit & Mackinac Railroad, succeeding Mr. C. H. Coster, of the banking-house of J. P. Morgan & Co., who was elected to the office when the company was organized to succeed the Detroit, Bay City & Alpena. Mr. Hawks at that time was elected Vice-President and General Manager, having held those offices with the old company. Mr. George M. Crocker has been elected Vice-President and Auditor.

—A party of Japanese engineers, consisting of Mr. Michitaro Oshima, Technical Director; Mr. Gisho Yasnaga, Mechanical Engineer; Mr. F. Obana, Engineer, and Mr. T. Takayama, Chief Chemist, all of the Imperial Steel Works, accompanied by Mr. K. Komura, of the Kamaisha Iron Works, Japan, is investigating the various methods employed in this country in the manufacture of steel. The delegation left Chicago for the East Nov. 26 and will reach New York between Dec. 10 and 15. Stops will be made at Cleveland and Pittsburgh, staying in the latter place about one week.

—Mr. Charles E. Henderson has been elected Second Vice-President of the Philadelphia & Reading Railroad Co., and will have especial jurisdiction in the freight traffic department of the company. He is now Vice-President and General Manager of the Coal & Iron Co., and has managed those properties since the Presidency of Mr. McLeod. Before going to the Coal & Iron Co., in 1887 he had been for a number of years an officer of roads in Ohio and Illinois, having been General Manager and Receiver of the Indiana, Bloomington & Western, the Ohio Southern, the Dayton & Ironton and other roads in that section.

—Mr. Robert E. Marshall, Superintendent of the Altoona Division of the Pennsylvania, shot himself on the afternoon of Monday last in Washington, D. C., at the home of his brother, where he had been staying for some days recently. He died immediately. Mr. Marshall had been under treatment for nervous prostration for some time past. He had spent the Thanksgiving holidays with his family to secure rest and was thought to have improved very much in that brief time. He began his active life in the machine shops of the Pennsylvania at Altoona in 1881, and by various promotions finally became Division Superintendent.

—Mr. Augustine A. Heard, Secretary of the Central Passenger Committee, has tendered his resignation, to take effect on Jan. 1, and will return to Buffalo, to become Western Passenger Agent of the Lehigh Valley road. Mr. Heard will succeed General Western Passenger Agent Edwin B. Byington, who retires from active railroad work, after 22 years' service with the Lehigh Valley, but the position of General Western Passenger Agent will be abolished. While Mr. Byington is to retire from active work, it is understood that he will have supervision of the company's outside agencies Mr. Heard went to Chicago last September from Buffalo, where for several years he had been General Passenger Agent of the Northern Steamship Company. Formerly he was Assistant General Passenger Agent of the Missouri Pacific.

—Ex-United States Senator John Scott, formerly General Solicitor of the Pennsylvania Railroad Company, died Sunday night last at his home in Philadelphia, in his 75th year. He had resigned his office in February, 1895, on account of ill health. Practically all his professional life had been with the Pennsylvania Railroad. His political career was brief and incidental to his professional work. He was an attorney of the Pennsylvania in 1857. At the close of his term as United States Senator in 1875, he removed to Pittsburgh, and took charge of the legal business of the lines west of Pittsburgh for the Pennsylvania Company, organizing the legal department for these lines. In November, 1877, Mr. Scott was called to take charge of the legal department of the Pennsylvania Railroad Company in Philadelphia, and until February, 1895, was General Solicitor of the Pennsylvania Railroad Company and its allied lines.

—Mr. Payson Tucker was this week succeeded as General Manager of the Maine Central by Mr. George F. Evans, Assistant General Manager of the Boston & Maine. This action took place at the meeting of the directors at Portland, Me., on Nov. 30. Mr. Tucker is also Vice-President and a director of the railroad company, and the change does not affect these offices. The annual stockholders' meeting of the Maine Central was held six weeks ago, and at that time Mr. Tucker was re-elected a director by the same vote as that given to other directors, and also Vice-President, but it appears that there have been differences of opinion between him and the directors, and the final outcome has been his retirement as General Manager. This has been a great local surprise, as Mr. Tucker has been identified with the management of the Maine Central for 22 years. There have been a great many statements that the change in the General Manager meant a closer connection in the operation of the road with the Boston & Maine, which controls the Maine Central. Under Mr. Tucker the line has been operated as a distinct line, and practically as an independent property. President Tuttle, of the Boston & Maine, a director of the Maine Central, says that these statements are not well founded and that no change is contemplated in the relations which have existed between the two properties.

Mr. Evans, the new General Manager, was formerly with the Louisville, Evansville & St. Louis as General Manager. He resigned that office early in 1891 to go to the Boston & Maine, when Mr. Sanborn was promoted to be General Manager of the Boston & Maine, Mr. Evans becoming Superintendent of the Southern Lines, which included the old Boston & Lowell. He became Assistant General Manager in November, 1895.

Mr. Tucker has been so long the active executive officer of the Maine Central that he has come to be identified with the railroad itself by the people of Maine, and his unexpected retirement takes up a good deal of public attention. Mr. Tucker is now about 56 years old and is wealthy, with many private interests. It is said that his first experience in railroad life was as a train boy on a small line in Maine. Afterwards he became a superintendent's clerk and then was a conductor on the Eastern Railroad. He was next General Agent of the Boston & Maine at Portland, and has since then been identified with railroad work in Maine. About 1875 he became Superintendent and later General Manager of the Maine Central, then in poor financial condition Undoubtedly a very large share of the advance which has been made by that company in its financial, as well as in its physical condition, is due to the marked ability of Mr. Tucker as an executive officer.

ELECTIONS AND APPOINTMENTS.

Chicago & Northwestern.—John L. Ferguson, City Passenger Agent at Chicago, has been appointed Assistant General Passenger Agent, with jurisdiction over the local traffic of this company William M. Dodd has been appointed City Passenger Agent at Chicago to succeed Mr. Ferguson.

Cleveland, Cincinnati, Chicago & St. Louis.—E. M. Neel, Superintendent of the St. Louis Division, retired Dec. 1. He has been appointed Assistant to General Superintendent Van Winkle. Superintendent Bailey, of the Cairo Division, will succeed Mr. Neel on the St. Louis Division, and William Quinn, Train-Master of the Cairo Division, will be appointed Superintendent of the Cairo Division, the office of train-master being abolished.

Great Northern.—Second Vice-President Newman, of this road, has issued a circular announcing that the position of Traffic Manager of the company, made vacant by the resignation of H. L. Shute, will be abolished.

Gulf, Beaumont & Kansas City.—J. H. Phillips has been elected Secretary and Treasurer, vice W. C. Averill. W. W. Willsen, Assistant General Manager, fills Mr. Averill's place on the Board of Directors.

Lehigh Valley.—Edwin B. Byington, General Western Passenger Agent, will be succeeded on Jan. 1 by Augustine A. Heard formerly General Passenger Agent of the Northern Steamship Company and now Secretary of the Central Passenger Committee at Chicago. The title of the office will be changed to that of Western Passenger Agent.

Mexico, Cuernavaca & Pacific.—At the annual meeting of the stockholders, held in the City of Mexico, Dec. 1, Directors were chosen as follows: J. H. Hampson, W. O. Staples, Luis Mandez, George L. Hodges, Charles Wheeler, Santiago Mandez and Francisco P. Giochicoa. The officers are J. H. Hampson, President and General Manager; W. O. Staples, Vice-President and Assistant Secretary; Charles Wheeler, Secretary and Treasurer; J. M. Brash, Assistant Treasurer.

Philadelphia & Reading.—The several departments of the service of the new company have been organized as follows: President, Joseph S. Harris; First Vice-President, Theodore Voorhees; Second Vice-President, Chas. E. Henderson; General Solicitor, J. D. Campbell; Secretary, W. R. Taylor; Treasurer, W. A. Church; Comptroller, Daniel Jones. The First Vice President will have charge of the operations of all railroads and other transportation lines owned, leased or controlled by this company and of the passenger traffic. The following officers will report directly to him: I. A. Sweigard General Superintendent; H. K. Nichols, Chief Engineer; A. Foster, Purchasing Agent; C. G. Hancock, General Passenger Agent; J. H. Loomis, Real Estate Agent. The Second Vice President will have general supervision of freight traffic. The following officers will report directly to him: B. H. Bail, General Freight Agent, and John H. Jones, Coal Freight Agent.

Savannah, Florida & Western.—The annual meeting of the stockholders was held at Savannah, Ga., Nov. 24. The retiring board of directors was re-elected as follows: H. B. Plant, M. K. Jesup, H. M. Flagler, R. G. Erwin, M. F. Plant, B. F. Newcomer and J. H. Estill.

At the annual meeting of the Savannah, Florida & Western in Savannah, Ga., on Nov. 24, the following Directors were elected: H. B. Plant, R. G. Erwin, M. K. Jessup, H. M. Flagler, B. F. Newcomer, and J. H. Estill.

Seaboard Air Line.—O. B. Bidwell, Jr., has been appointed Freight Claim Agent, to succeed J. W. Wilson, resigned, and began his duties Dec. 1, with headquarters at Portsmouth, Va.

Southern.—The Car Record and Mileage Bureau has been placed under control of the Auditor. Car tracers, and correspondence relative to car distribution, will be addressed to the Superintendent of Car Service as heretofore.

Wabash.—H. H. Purcell has been appointed Contracting Freight Agent of the road, with office in the Royal Insurance Building, Chicago. T. P. Scott has been appointed Traveling Freight Agent in place of Mr. Purcell, also with office in Chicago.

RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

Astoria & Goble.—There has been some renewed activity on the construction of this line in the last few weeks, and it is stated that the directors will shortly have a large force at work. The line is built for some distance out of Astoria, Wash., and is now being extended along the Columbia River to a connection with the Northern Pacific.

Atlantic Coast Line.—The local newspapers assert that the Atlantic Coast Line is planning a new short route between Norfolk, Va., and Wilmington, N. C., and that surveys are now being made for an extension from Washington, N. C., to Newberne, a distance of about 25 miles. At Newberne the extension would connect with the Wilmington, Newberne & Norfolk, giving a route shorter than by the present Atlantic Coast Line between Norfolk and Wilmington. The new road would enter the garden-trucking section of Eastern North Carolina and compete with the Norfolk & Southern road.

Bellefonte Central.—The company has about completed its extension to Pine Grove Mills, Pa., and trains will soon be running regularly to that place. The company has also proposed the further extension of the road across the Tussey Mountain to Huntingdon, where connection will be made with both the Pennsylvania and the Bell's Gap branch. Such an extension would shorten the distance between Bellefonte and the east about 75 miles.

Boise, Nampa & Owyhee.—Active construction work, which has been suspended for some time, has again been resumed on this road in Idaho, and tracklaying has been begun. Grading has been completed between Nampa, Idaho, and the Snake River. The rapid development of mines in Owyhee County makes it desirable to finish the road. Mining timbers and fuel are in great demand, being scarce in the vicinity of the mines. The present intention is to carry the grading as far as Booneville this winter.

Burrard Inlet & Fraser Valley.—President Winter, of the Northern Pacific, writes to the projectors at Vancouver, B. C., that the new company does not intend to assume the contract made by the old company to construct a line from Vancouver to Sumas, B. C., which was to connect the Northern Pacific with Vancouver.

Butler & Pittsburgh.—The remaining contract for the completion of the road has been let to Rodgers & Co., of New York. This section of the road will necessitate heavy grading, as it lies between the Allegheny River and the hilly region in the divide between the last-named valley and the Monongahela River.

Chicago, Bluffton & Cincinnati.—This company filed articles of association in Indiana last week. The company proposes to build a road through the oil region of the state, extending from Union City to a point on the Baltimore & Ohio road, near Milford Junction. The road proposed will penetrate the counties of Randolf, Jay, Blackford, Wells, Huntington, Whitley and Kosciusko. Hugh Dougherty, of Bluffton, is at the head of the enterprise.

Chicago, Weatherford & Brazos Valley.—Some time ago a line was located between Bridgeport and Weatherford, Tex., a distance of about 36 miles, and a good deal of right of way for the line was secured without much further being done. The project has now been taken up by a company organized under the above name, and the projectors hope to be able to shortly make financial arrangements to warrant them in beginning active work. The entire right of way has now been secured, together with ground for stations at each of the terminal points. Subsidies to the amount of about $50,000 have also been secured along the line. Close estimates of the cost of grading have been made, and it is believed that this cost will not exceed $100,000. Surveys have been made by F. H. Peters, and officers of the Chicago, Rock Island & Pacific, whose Fort Worth line passes through Bridgeport, state that the profile and alignment show an unexpectedly good line. Besides the connection with the Rock Island at Bridgeport the new line would connect at Weatherford, which is a promising town just west of Fort Worth, with the Texas Pacific and the Gulf, Colorado & Santa Fe. Henry Warren, of Weatherford, Tex., is President.

Columbia & Kootenay.—This company will apply to Parliament next session for power to construct the railroad between a point on its present line between Nelson and Robson, B. C., on the south and Revelstoke on the north. This line is operated by the Canadian Pacific, and the extension would connect two of its branches in the Kootenay mining district.

Crow's Nest Pass.—Application will be made at the next session of the Canadian Parliament for an act to incorporate a company under this name to construct and operate a road from a point near Lethbridge, in Alberta, through the Crow's Nest Pass, to Rossland, B. C., with a branch line to Nelson, on the Canadian Pacific.

Eldorado Springs.—The railroad committee of El Dorado Springs, Mo., has made a contract with J. M. Perry and John Sherman, representatives of the Midland Construction Co., of Des Moines, Ia., for the construction and equipment of a standard-gage road from El Dorado Springs to Walker, Mo., a station on the Missouri, Kansas & Texas Ry. The work is to begin at once. El Dorado Springs is a sanitary resort about 95 miles southeast of Kansas City and 22 miles due east of Nevada, Mo.

Elmira, Cortland & Northern.—It is reported that this division of the Lehigh Valley may soon be extended from Camden, the present terminus, to the St. Lawrence River. The extension was first projected in 1891, when President Corbin had a line surveyed north from Camden to Watertown and Alexandria Bay, paralleling the Rome, Watertown & Ogdensburg road, which has since passed into the control of the New York Central.

Gauley Mountain Coal.—It is reported that a contract is soon to be awarded for building this road, which is proposed from Deep Water, W. Va., where it will connect with the Chesapeake & Ohio, to Gauley Mountain, about five miles. The grade will be 1.06 per cent. Right of way has been obtained and capital subscribed. W. N. Page, Ansted, W. Va., is President.

Glendon & Gulf.—This North Carolina road is being gradually extended and the trains now run two miles beyond Deep River. A small force is now grading the extension, which will ultimately reach Charlotte, N. C., about 100 miles.

Gulf, Beaumont & Kansas City.—Vice-President J. H. Kirby is now in Boston to confer with the Eastern interests of the property in regard to plans for its extension.

The charter is to be amended to authorize the building of the following new lines: An Eastern line to Alexandria, La., from Kirbyville, about 90 miles, through the counties of Jasper and Newton, in Texas, and Rapides parish of Louisiana; from Kirbyville to Marshall, about 125 miles, penetrating Jasper, San Augustine, Shelby, Panola and Harrison counties, the lumber districts of Southwestern Texas, and connecting with the Texas & Pacific for points east and west. It is intended to begin the western extension at a point between Jasper, in Jasper County, and Center, in Shelby County, and extend northwesterly through Nacodoches, Cherokee, Rusk, Smith, Anderson, Henderson, Van Zandt, Kaufman, Ellis, Dallas and Tarrant counties to Fort Worth.

Kansas City, Pittsburgh & Gulf.—Night gangs have just been ordered for the rock work south of Mena, Ark., to which point the road is now in operation, and grading will go rapidly forward from that point to completion. Mr. W. A. Williams, General Manager of the Southern Division (the Texarkana & Fort Smith,), states that the White Cliffs branch is completed and operation thereupon commenced Nov. 10. The cement works at White Cliffs, Tex., will commence operations

Dec. 1. The new town of Chicago, on this branch, is developing rapidly. Arrangements have also been completed to move a 10,000 spindle cotton mill from Allegheny City, Pa. Shreveport is also growing rapidly under the impulse given by the entrance of the road. Work on the line north of Horatio, Ark., toward Mena, is progressing rapidly, and 10 miles will be ready for track in two weeks' time.

Maine Central.—A branch road from Mechanic Falls to Norway, Me., is reported to be under consideration with the prospect of taking up construction next spring.

Mexican International.—After a suspension of over a year, a large force of men has been put at work constructing the branch from Reata Station, south of Monclovia to Monterey. The road will be completed and in operation in about three months, and will give a direct line into Monterey, which has become an important smelting, mining and manufacturing town.

Mexico, Cuernavaca & Pacific.—At the recent annual meeting of stockholders in Denver, it was stated that grading is being pushed rapidly, and it is probable that Cuernavaca will be reached by June, 1897. Practically 70 miles of road are completed, and an equipment has been purchased consisting of 6 locomotives, 102 freight cars and 7 passenger cars. The Mexico & Acapulco Construction Co. has the contract for building the entire 300 miles to the Pacific coast at Acapulco.

Mobile & Girard.—There is considerable talk in the local papers regarding the extension of this road from Seawright, Ala., to Brewton, Ala., 40 miles nearer Mobile. Brewton is on the Louisville & Nashville road, and if the Mobile & Girard is extended to that point a direct route between Columbus, Ga., its northern termins, and Mobile will be established. When work on the Mobile & Girard was begun years ago the plan was to build through to Mobile. The road was never constructed any further than Seawright. A year ago the road was sold and was bought by representatives of the bondholders. It is operated by the Central of Georgia and is supposed to be owned by the Central. The extension of the road would develop a rich timber section.

Montana.—The road commenced to run regular freight and passenger trains last week over the 60 miles from Leadboro, near Castle, to a point near Townsend, Mont., where it connects with the Northern Pacific. The district is rich in minerals, and many important mines which heretofore have had no outlet. The first regular train was an ore train, and carried 300 tons of silver and gold ores for the East Helena smelter.

Montreal & Ottawa.—This road, which will give the Canadian Pacific a new route to Ottawa, is now completed to Vankleek Hill, Ont., and will be opened within the next few days The new line leaves Rigaud, which is 40 miles from Montreal and 16½ miles from Vaudreuil, goes through Ste. Eugene, Vankleek Hill, Caledonia Springs to Alfred, 29½ miles from Rigaud. It is expected that the line will be finished to Alfred within the next fortnight. The line will be shorter than the present route to Ottawa.

Natches Pass.—About four miles of this road, formerly known as the White & Columbia River Railroad, is now built out of Buckley, Wash. The line extends up White River in an easterly direction into timber lands, and the road will be gradually extended as required to reach new timber. Its ultimate objective point is the Columbia River. At Buckley, connection is made with the Northern Pacific. The road has been built entirely without bonded indebtedness, and at present is merely a logging line, although it is expected that later on it will do a better railroad business. The officers are Wm. Fettig, President; C. W. Joynt, Vice-President and Manager; James McNeely, Secretary, and Thos. McNeely, Treasurer.

Natchez, Red River & Texas.—C. A. Gardner, Vice-President of the road, with headquarters in Natchez, states that this winter work will be begun in completing this line from Jonesville to Shreveport, La. At present the road only extends from Vidalia to Jonesville. The line when completed will connect at Shreveport with the Texas & Pacific, the Kansas City, Watkins & Gulf and the Queen & Crescent. At its eastern terminus it connects with the Illinois Central.

New York, Susquehanna & Western.—A survey has recently been made by engineers under the direction of Mr. Rusling, Chief Engineer of this company, for a short branch road from a point on its line in Sussex County to Newton, about three miles distant. The grade is an easy one, and the lands which will be needed for right of way are not very expensive. Whether there is any intention of building the line immediately seems to be a matter of which there is considerable doubt. Newton is a small town, but has a number of factories which would afford considerable traffic for such a line.

Northwestern Elevated (Chicago).—This company has recently sold an issue of its bonds for $3,000,000 to complete the construction of the elevated line at Chicago. So far $5,525,506 have been expended in building the road, and the new money should complete the line. It is believed that the company will finally issue $10,000,000 common stock and $6,666,666 preferred 6 per cent. stock, the entire stock going to the Columbia Construction Co. for building the line. The Columbia capital stock is $5,000,000.

Omaha, Quincy & Eastern.—One of the executive officers states that the company will be ready to go ahead immediately with the construction of the connecting link of 34 miles from Trenton to Pattonsburg, consolidating the Quincy, Omaha & Kansas City and Omaha & St Louis roads, and making a through line from Quincy to Omaha. It will be known as the Omaha, Kansas City & Eastern. All the legal preliminary work in New York has been completed. The syndicate has plenty of money and is anxious to get to work and has already been negotiating with contractors. Bids will be advertised for in a short time. The line is all surveyed and everything is in readiness to let the contract and commence the actual work of construction. C. M. Collins, of Quincy, has been appointed Chief Engineer of the work.

Pittsburgh & Eastern.—Regular train service was commenced last week between Mehaffey and Glen Campbell, the first 12 miles through Indiana County in Pennsylvania. Three passenger trains are run each way daily. There are seven stations on the section of the road operated. It is expected that another section of 30 miles, which will bring the terminus of the road to Marion, will be placed under contract shortly. S. H. Hicks, the General Manager, has established his headquarters at Mehaffey, Pa.

Rossland & Trail.—F. August Heinze, of Rossland, B. C., who is interested in the Columbia & Western Electric Railroad, has advertised for bids for the construction of a standard-gage road between Rossland and Trail in the Kootenay mining district in Southern British Columbia. The contract calls for the completion of the road in 60 days.

St. Louis, Kansas & Texas.—Dwight Braman has been appointed receiver for the road on the petition of the Farmers' Loan & Trust Co of New York. The road is 60 miles in length and extends from Arkansas City to Anthony, Kan. It was formerly operated by the St. Louis & San Francisco, but was not included in the reorganization. It has not been operated for the past 30 days.

St. Louis, Oklahoma & Southern.—The contract for building this road has been given to Messrs. Calahan & Wogan, of Omaha, and work will be commenced immediately. The road will run from a point at or west of Claremore, I. T., to Shawnee, Okla.

Southern Pacific.—Vice-President Crocker has been quoted in recent newspaper interviews as stating that the company has decided to resume work on the Coast Division in Southern California and to complete the line as rapidly as possible. The work was suspended a few months ago on account of the financial depression, but under present conditions the company is now able to sell its bonds to carry on this work at a satisfactory price, and large construction forces will immediately be put on the work.

Texas Midland.—President Green having just finished the extension of this line on the northern end into Paris, Tex., is now undertaking to begin work on a southern extension from Ennis, the present terminus, to Waco, about 63 miles southwest. He states that active work will be started as soon as a few remaining right-of-way contracts have been settled. At Waco new connections with the Missouri, Kansas & Texas, the St. Louis Southwestern, San Antonio & Aransas Pass, Houston & Texas Central and the Waco & Northwestern roads will be made.

Waycross Air Line.—Rails and cross-ties for building three miles of road have been received at Nichols, Ga., and work will be started in a short time on the extension from Nichols, three miles toward Douglas. The road at present is 30 miles long, Nichols being the northern terminus. It is about 13 miles from Nichols to Douglas, and on the completion of the three miles from Nichols, the company will probably make an effort to extend the line to Douglas.

West Virginia Central & Pittsburgh.—The new connection with the Baltimore & Ohio at Cumberland, Md., has been completed. About a fourth of a mile of new second track was required to make the connecting link. The connection leaves the main line of the West Virginia Central & Pittsburgh east of the Potomac River bridge. The change will do away with the hauling of this company's freight through Cumberland, and will facilitate the exchange of traffic between the two roads. The expense of the improvement is divided. The present connection of the two roads is west of Cumberland, and just west of the viaduct over Mills Creek. The yard of the West Virginia Central & Pittsburgh is considerably below the tracks of the Baltimore & Ohio, and the connecting tracks have a steep grade.

Yankton, Norfolk & Southwestern.—It is said that work has been begun on this road, which is proposed to connect Yankton, S. Dak., with Norfolk, Neb. Ex-Chief Engineer Miller, of the Great Northern, now at Yankton, has charge of operations, and he is reported to have said that he expects the line to be completed next spring. The line was nearly all graded several years ago, and the work now being done is undertaken by the English company which controls the property.

Electric Railroad Construction.

Allegheny, Pa.—The extensive improvements now being made by the Pleasant Valley road on California avenue are nearly completed. Numerous cuts and fills have been made in the street west of the Woods Run bridge.

Allentown, Pa.—Rights of way have been secured and rails have been purchased for the electric road between Allentown and Kertztown, in Berks County.

Baltimore, Md.—At a meeting of the First Branch of the City Council held on Nov. 23, measures were introduced in the interest of the City Passenger Railway Co., the Traction Co, City & Suburban Co., and other street railroad companies, all of which desired to make extensions of their present lines within the city limits. The measures were referred to the committee on city passenger railroads.

Bangor, Me.—The Bangor Street Railway Public Works Co. has petitioned the Common Council for permission to build an electric line from West Market to Haymarket squares. The road is designed to be used to carry express and freight for the Bangor, Orono & Oldtown Railway Co.

Brantford, Ont.—It is proposed to build the electric road from Brantford to Galt and Port Dover, a charter for which was obtained last year. Among those interested are Mayor Elliott and Dr. Secord, of Brantford, and Henry Stroud, of Paris.

Bristol, Pa.—The Langhorne & Bristol electric road was completed through Hulmesville last week. The road is being rapidly built to Bristol.

Camden, N. J.—Plans have been prepared for a carhouse, shed and stables for the Camden & Suburban Railroad Co. There will also be repair shops with latest improved electrical appliances. The estimated cost is $100,000.

President Scull, of the Camden & Suburban Railroad Co., has been notified that the Pennsylvania Railroad has withdrawn all opposition to the electric road laying the cross-overs at Third and Bridge avenue and Third and Main streets. The cross-town line previously referred to among our notes will be completed in a few days.

Charlotte, N. C.—The Charlotte Electric Light & Railway Co., known as the "4 C's," will double track its present line.

Cincinnati, O.—Money is being raised for the extension of the Main street line from Mills avenue, Lockland, to the Benson street bridge over Mill Creek, in Reading. The consents for the right of way for nearly two miles have been secured.

Elmira, N. Y.—President J. E. Mulford, of the Elmira & Watkins Railway Co., states positively that the line will be built within a very short time.

Farmington, Conn.—The proposed route for the new electric road is from Farmington station to Farmington street and there to connect with the Hartford road. A branch will be run from the Bristol & New Britain road and will intersect the Harwinton line at the copper mines. This would give Torrington connection with Bristol and New Britain. Noble E. Pierce, of Bristol, has been engaged as attorney and Theodore H. McKenzie, of Southington, as engineer for the towns along the route of the proposed road.

Fayetteville, Ark.—The officers of the Fayetteville Electric Railroad Co., referred to among our notes of Nov. 13, are as follows: President, J. A. Griffin; Vice-President, O. M. Wallace; Secretary and Treasurer, J. W. Lipsley.

Hazleton, Pa.—The Lehigh Traction Co. is laying a track from their West Hazleton branch to Hazel Mines breaker for the purpose of hauling coal from that colliery to the power-house and Hazle Park.

Johnstown, Pa.—The extension of the city electric railroad to Franklin Borough was completed last week and put in service.

Kingston, Ont.—The City Council has granted the right to the Electric Street Railway Co. to extend its line to the outer G. T. R. Station. The company agrees to pay two-thirds of the cost of keeping the streets free of snow.

Lachine, Que.—The Montreal Park & Island Railway Co. has completed its new line from Notre Dame street west to College street, Lachine, a distance of about five miles. Double tracks have been laid all the way.

Lock Haven, Pa.—The material is all on hand for the extension of the Lock Haven Traction Co. to Mill Hall.

Lyons, N. Y.—The residents of Wayne County are forming a company to build an electric railroad to run from Clyde to Palmyra, a distance of about 20 miles, and possibly to diverge so as to take in the towns of Walcott and Savannah. Press reports state that there is at present $100,000 back of the enterprise.

Marine City, Mich.—We have been informed that a franchise has been granted to John B. Dyar and F. S. Parker for an electric railroad from Marine City to Mt. Clemens, and is a branch running to Algonac. The company has agreed to file a bond of $2,000 to have the road completed by Sept. 1, 1897.

New Castle, Pa.—The electric street railroads of New Castle are being rebuilt and extended by Pittsburgh capitalists at a cost of about $30,000. The repairs and extensions have occupied about four months, and the roads will be in operation again about the middle of December. The syndicate, consisting of Hon. Richard Quay, Senator Arthur Kennedy and Dewitt Dilworth and others paid about $90,000 for the roads, and also bought the are, and incandescent lighting system of the city as well as the gas works.

Patchogue, L. I.—The Patchogue Village Trustees have decided against the Patchogue & Port Jefferson Traction Co., in the latter's application for a franchise to build its electric road on Ocean avenue and North Ocean avenue, as referred to last week.

Port Richmond, S. I., N. Y.—On Nov. 27, the Staten Island Electric Railroad Co. began to lay its double-track line from Richmond avenue, Port Richmond, to Graniteville. About 60 men started on the work.

Quakertown, Pa.—A charter was issued at Harrisburg on Nov. 27, to the Quakertown Traction Co., of Bucks County, the capital stock of which is $100,000, to build an electric road six miles in length, running through the borough of Quakertown. C. Taylor Leland, of Newton, is President.

Sherbrooke, Que.—The organization of the Sherbrooke Street Railway Co. is completed and preparations are being made for the construction and operation of the proposed line Track-laying will not be possible until the spring, but arrangements will be made at once for terminal stations and for motive power.

Springfield, Mass.—Mr. J. W. Starr, one of the principal promoters of the Springfield & Southwestern Street Railway, states that 25,000 sleepers for the company's track have already been ordered and that he expects to begin work soon and continue it through the winter if the weather is not too severe. The questions of a bridge across the Connecticut River and of right of way within the city of Springfield have not yet been settled, but the company proposes to go on with the construction of its line west of the river without regard to these contingencies. The line of the proposed road is southwestward from Springfield through Agawam to Suffield, Conn. No rights have yet been secured in Connecticut, but the intention is to build westward from Suffield to West Suffield, thence to Granby, and from there to Rainbow

Westfield, Mass.—The Woronoco Street Railway Co., of this town, has applied for a franchise for the construction of an extension of its line eastward about three miles to the town limits, and a hearing will be given by the town officials on Dec. 22. There is strong opposition to the project on the part of some of the merchants. If the proposed extension is built, a connection with it will probably be made by the company now operating a line from Springfield westward, thus making a continuous street railroad between Springfield and Westfield, a distance of about 10 miles.

Winterport, Me.—The stockholders of the Hampden & Winterport Electric Street Railway Co. have elected the following directors: Henry L. Mitchell, E. C. Nichols, Bangor; H. W. Mayo, Hampden; I A. Kelsey, Tracy Walker, New Haven; Thomas M. Waller, S. H. Wagner, New York. At the directors' meeting these officers were elected: H. L. Mitchell, President; Israel A. Kelsey, Treasurer; H. W. Mayo, Secretary.

Ypsilanti, Mich.—The electric road from Ypsilanti to Ann Arbor has been completed and cars will be running regularly within a few days.

GENERAL RAILROAD NEWS.

Atchison, Topeka & Santa Fe.—The earnings (exclusive of taxes and rentals) for October were:

	1896.	1895.	Inc. or Dec.
Gross earn	$3,053,052	$3,036,182	I. $16,870
Oper. exp	1,966,710	2,104,263	D. 137,555
Net earn	$1,083,342	$931,919	I. $154,423
Av. oper. mileage	6,435	6,481	D. 46
Four months to Oct. 31.			
Gross earn	$10,403,253	$9,838,691	I. $564,562
Oper. exp	7,231,188	7,921,314	D. 688,126
Net earn	$3,170,065	$1,917,377	I. $1,252,688
Av. oper. mileage	6,435	6,481	46

Butler & Pittsburgh.—Plans for the formal consolidation of this line with the Pittsburgh, Shenango & Lake Erie, which forms the Northern Division of the line, and the Union Railway, a belt line of the Carnegie Steel Co., appear to be practically decided upon. It is stated that the proposed terms will be passed upon by a meeting of the directors this week, and that a special meeting of the stockholders of the companies will then be called. The capital stock of the Pittsburgh, Shenango & Lake Erie is $4,800,000, and that of the Butler & Pittsburgh is $5,200,000.

Cape Fear & Yadkin Valley.—Judge Simonton, of the United States Circuit Court, at Richmond, Va., last week denied the application of the Farmers' Loan and Trust Co., of New York, for the appointment of a co-Receiver of this road, to act with the present Receiver, Gen. John Gill, of Baltimore.

Central Pacific.—The company has arranged to extend the $3,997,000 first mortgage gold bonds, maturing Jan. 1 next, so that the principal shall become payable in one year from that date, with interest, meanwhile, payable semi annually at the rate of five per cent. The company reserves the right to redeem the bonds so extended at any time on paying to the bondholder the par value of the bonds and interest at the rate of six per cent. from Jan. 1 next.

Chesapeake & Ohio.—The October earnings are reported as follows:

	1896.	1895.	1894.
Gross earn	$892,510	$906,915	$870,882
Oper. exp	578.410	597,286	568,819
Net earn	$314,100	$309,629	$302,063
P. c. exp. to earn	64⅞	65⅞	65¼
Net 4 mos	1,208,169	1,124,896	1 196,716

Net in Oct. 1893, $310,051.

Cleveland, Cincinnati, Chicago & St. Louis.—The October earnings are reported as follows:

	1896.	1895.	1894.
Gross earn	$1,152,762	$1.3:7,485	$1,290,200
Oper. exp	896,412	972,119	950,559
Net earn	$256.350	$355,366	$339.641
P. c. exp. to earn	77¾	73¼	73⅝
Int. and rentals	230,551	231,569	232.565
Surplus	$25,799	$123,797	$107,136
Net 4 mos	1,085,968	1,323,342	1,120,475

Erie.—The company reports for October:

	1896.	1895.	Inc. or dec.
Gross earn	$3,098,294	$3,166,463	D. $68.169
Oper. exp	2,092,726	2,148,453	D. 55,727
Net earn	$1,005,568	$1,018,010	D. $12,442
From Dec. 1 to Oct. 31:			
Gross earn	$28,195.526	$27.422.609	I. $772,917
Oper. expen	20,723,033	20,447,444	I. 275,589
Net earn	$7,472,493	$6,975.165	I. $497.328

In the expenses of 1896 taxes are included.

Forest City & Sioux City.—The New York Security & Trust Co. has purchased this road, extending from Gettysburg to Forest City, S. Dak., 16 miles, for $52,500 at a sale ordered by the United States District Court. The road has not been operated for a year. The sale included the property of the Forest City Land Improvement Company.

Green Bay, Winona & St. Paul.—The final decree has been entered in the foreclosure proceedings against this road, and the Receiver discharged. The decree provides that the Green Bay & Western, the new company, assumes the liability upon unsettled or disputed claims. The new company has been in control of the road for some time.

Indiana & Lake Michigan.—Valney T. Molott, who was recently appointed Receiver of the Terre Haute & Indianapolis properties, was last week appointed Receiver of this line, which is one of the subsidiary corporations of the former company. It extends from South Bend to Lake Michigan at St. Joseph, Mich., and is 40 miles long, giving the Vandalia line its outlet to Lake Michigan. The Receiver was appointed in a suit filed by the Central Trust Co., of New York City, trustee of the first mortgage bonds for $480,000, default having been made upon the interest payment due in September.

Long Island.—The earnings for the quarter ending Sept. 30 are reported as follows:

	1896.	1895.	1894.
Gross earn	$1,405,647	$1,438 494	$1,405,472
Oper. exp	765,606	769,985	771,996
Net earn	$640,041	$.68,509	$633.476
P. c. expen. to earn	54⅝	53½	54⅞
Total income	720,148	735,109	699 875
Charges	314.121	295 138	288,585
Surplus	$406,027	$139,971	$411,288

Louisville, New Albany & Chicago.—Receiver McDoel has been authorized to issue certificates for $200,000, bearing 6 per cent. interest, by the United States Circuit Court at Indianapolis. The proceeds are to be used to carry on various betterments. The Reorganization Committee has declared its plan operative, as a large majority of all classes of securities have been deposited. The privilege of subscribing to the common stock of the new corporation has been extended to Dec. 31.

The Receiver proposes to rebuild seven bridges at a cost of $38,000, repair and rebuild 500 box cars for $43 720, and repair a number of engines at a cost of $50,000; to take out the curves and reduce the grade at Lowell, near Cedar Lake, at a cost of $24,000, and spend $50,000 between Lowell and Indianapolis, reducing grades and doing other work. There is also considerable ballasting to be done between Campbellsburg and New Albany, and between Campbellsburg and Lafayette.

Mine Hill & Schuylkill.—The stockholders have voted to accept the proposition of the Philadelphia & Reading for a reduction in the rate of dividend Upward of 31,000 shares of stock voted in favor of accepting the proposition and less than 500 against.

Philadelphia & Reading.—The earnings of the railroad company for October were:

	1896.	1895.	1894.	1893.
Gross earn	$2,060,105	$2,274,260	$2,001,791	$2,427,430
Oper. exp	937,398	1.060,776	1,067,987	1, 74.269
Net earn	1,122,707	1,213,483	933,804	1,053,161
Total income	1,168,857	1,241,656	964,312	1,107,939
Fixed charges	887,583	810,612	864,078	857,279
Surplus	281,274	401,043	100,234	250.659
11 mos. deficit	368,774	Sur. 50,768	1,347,543	807,933

The gross earnings of the Coal & Iron Co. in October, 1896, were $2,767.852. The 11 months' deficit was $1,051,883 in 1896 against $1,753,942 in 1895.

Oregon Short Line & Utah Northern.—The Reorganization Committee applied this week to the Judge of the United States Circuit Court at Salt Lake City for an order for the foreclosure of the road and to have a date set for the sale. Under the reorganization the road, which now comprises about 1,427 miles of line, will be operated independently of the Union Pacific. On Wednesday the order was granted and Jan. 9 named as the date of the sale.

Roanoke & Southern.—This road, extending between Winston and Roanoke, Va., 116 miles in length, was sold at public auction under mortgage foreclosure at Winston, N. C., Nov. 24, for $500,000 to a syndicate of capitalists, who propose to organize as the Norfolk, Roanoke & Southern Railroad Company. The property is then to be leased to the Norfolk & Western.

Southern.—The October earnings were as follows:

	1896.	1895.	Dec.
Mileage	4,752	4,588	
Gross earn	$1,896,706	$1,991,424	$94,718
Expen. and taxes	1,156,564	1,184,813	28,248
Net earn	740,141	806,611	66.470
P. c. expen. to earn	60.97	59.50	
Four months to Oct. 31.			
Gross earn	6,454.616	6,694,247	239,630
Expen. and taxes	4,.61,033	4,516,403	155,370
Net earn	2,693.583	2,177.844	84,260
P. c. expen. to earn	67.56	67.47	

Southern Pacific.—The September earnings are reported as follows:

	1896.	1895.	
Gross earn	$4,471,244	$4,481,734	D. $10.490
Oper. exp	2.672,153	2,825,422	D. 153,269
Net earn	$1,799,091	$1,656,312	I. $142,779
Net 9 mos	11.032,495	11.153,302	D. 120,807

Sutherlin & Milton.—This narrow-gage road, extending from Sutherlin, Va., three miles from Danville, to Milton, N. C., seven miles, was sold last week under foreclosure of the $26,000 of first-mortgage bonds. The property was sold to L. M. Warlick, of Winston, at $6,000, who says that the purchase has been made for his individual account.

Electric Railroad News.

Albany, N. Y.—The capital stock of the Albany, Helderberg & Schoharie Electric Railway Co. has been increased from $300,000 to $500,000.

Boston.—The vote taken at the annual meeting of the stockholders of the West End Street Railroad Co. resulted in the election of the following directors: G. T. W. Braman, Albert C. Houghton, Samuel Little, Samuel Spencer, Walter S. Swan, Alfred Winsor, William Hooper, T. Jefferson Coolidge, Henry D. Hyde, Joseph B. Russell, Richard M. Saltonstall and Stephen M. Weld. These directors were elected by a vote of about three to one shares voted in favor of the ticket supported by the old Executive Committee. The ticket elected is that put forward by the interests associated with J. P. Morgan & Co. and Kidder, Peabody & Co. The difference between the two interests have not been at all clear, but the chief point of difference has been over the value of the Meigs elevated charter to the West End Co. Messrs. Bowditch, Jackson and other directors opposed the acquisition of this lease by the West End Co., but have now been defeated by the vote of the shareholders. Six of the old Board will retire. The new Board has re-elected the former officials. The following are the members of the new Executive Committee: Samuel Little, ex-officio; Alfred Winsor, Joseph B. Russell, Walter S. Swan and W. A. Hooper. The regular semi-annual dividend of 4 per cent. on preferred stock, payable in January, has been declared.

Brooklyn.—The gross earnings of the Brooklyn Rapid Transit Company's system in November were:

	1896.	1895.	1894.
Brooklyn Heights	$360,047	$334.924	$365,817
Br., Queens Co. & Suburban	59,311	51,482	50,152
Total	$419,358	$386,406	$415,969
Five months ending Nov. 30:			
Brooklyn Heights	$1,976,331	$1,88?,409	$2,028,253
Br., Queens Co. & Suburban	325 939	299,075	277,006
Total	$2,302,300	$2,181,484	$2,315,259

Lancaster, Pa.—As a result of the application of George B. Lee and others, William B. Given has been appointed Receiver of the Pennsylvania Traction Co., which operates 50 miles electric road in Lancaster County. The authorized capital stock of the road is $10,000,000, of which $9,900,000 has been issued.

Middletown, O.—It is commonly reported that the Cincinnati, Hamilton & Dayton road has purchased the street-railroad lines of Middletown, O.

Salem, Or.—The Salem Motor Railway Co., operating five miles of line at Salem, now belongs to the State Insurance Co., of Oregon, E. C. Giltner, Receiver, which held a mortgage for about $35,000. The road was formerly a horse-car line and was extended about two miles to Morningside, when the motive power was changed to electricity. It has not been a paying road, as its route goes through a thinly settled district.

Streator, Ill.—C. C. Barr has been appointed Receiver of the Streator Railway Co. under foreclosure of the $160,000 mortgage. The capital stock of the road is $250,000, and it has been in operation five years.

Tiffin, O.—We have been informed that the Fostoria & Tiffin Electric Railroad, which has been lying uncompleted for the past four years is to be sold to Eastern capitalists and completed. The road is graded for 14 miles and is owned by S. B. Sneath of Tiffinie.

Tonawanda, N. Y.—The Buffalo Traction Co. is considering the purchase of the Buffalo, Kenmore & Tonawanda electric railroad. The traction company is to agree to extend the line so that it shall connect with the Elmwood Avenue line in Buffalo The line is six miles in length, and $64.850 of the total capital stock of $100,000 has been issued. The funded debt is $80,000.

Youngstown, O.—The Youngstown Street Railway Co., and the Mahoning Valley Electric Railroad Co., were consolidated on Nov. 17, the new company to be known as the Mahoning Valley Railroad Co. A. A. Anderson, of Youngstown, is General Manager.

The Mahoning Valley Railway Co. has filed with the Secretary of State an application to increase the capital stock from $150,000 to $1,500,000 and change the headquarters to Youngstown. This application is in consummation of the consolidation of the line of the Mahoning Valley and the Youngstown street railroads.

TRAFFIC.

Traffic Notes.

The Maine Central has lately established demurrage rules for freight cars containing bulk freight; and they will apply at all stations in the State of Maine. The first five days will be free; the charge for the second five days will be 25 cents per car per day, and after that 50 cents a day.

The railroad companies doing business between common points in Colorado and terminal points in California have petitioned the Interstate Commerce Commission for relief from the long and short haul section of the Interstate Commerce act. They say that competition with water transportation from Atlantic coast points to the Pacific market renders necessary a lower through rate than they can afford to make on business which is not carried entirely through. The Commission has ordered a hearing for Dec. 18.

Judge McKenna, in the U. S. Circuit Court at San Francisco, has rendered a decision in the suit of the Southern Pacific asking the Court to permanently enjoin the Railroad Commissioners of California from putting into effect a freight tariff issued by them about a year ago reducing freight rates on grain. The press despatches of Wednesday contradict those of Tuesday, but the latest one says that the injunction against the reduction in grain rates is not dissolved. The proposed reduction was about eight per cent. on grain, and the Commissioners proposed also to reduce rates on general freight 25 per cent. On the issuance of the order the railroad company at once appealed to the Court. On the trial of the case, the railroad company was assisted in the prosecution by the U. S. District Attorney, the latter's argument being that the Central Pacific, now a part of the Southern Pacific, would, if its freight rates were reduced, be unable to pay its heavy annual obligations to the U. S. Government.

Jurisdiction of the Joint Traffic Association.

Under the agreement governing the operation of the Joint Traffic Association the Board of Managers has wide discretion in deciding what traffic shall be subject to the rulings of the association; and acting under this authority the managers have passed a resolution which brings within their authority all freight, except coal, ores and oil, passing through most of the important junctions throughout the lines of the roads composing the association. The language of the resolution is about the same as that of Article 2 of the agreement, but the recent sweeping action of the board, in ordering the abolition, four months hence, of all commodity tariffs, led to very general investigation of the probable effect on competitive business of the clause mentioned, and in response to numerous inquiries the board announces that it has been

"*Resolved*, That the Managers hereby rule that all freight traffic not specifically exempted by Section 2 of Article 2 of the Articles of Organization, which passes to, from or through the specified Western termini of the Trunk lines, and such other points as may hereafter be designated by the Managers as additional termini; also all freight traffic which may pass through other junctions of the companies parties hereto which is included, when passing through any of the junctions now or hereafter specified, is competitive freight traffic subject to the jurisdiction, rules and recommendations of the managers, except such part thereof as has been or may hereafter be exempted by them."

Thus traffic passing, for instance, through Indianapolis is under the authority of the Managers, for it is a junction between the Pennsylvania lines and the Big Four. The junction of the New York Central with the Northern Central at Canandaigua, N. Y., is on the same basis as Buffalo, being a point of connection between lines of two different members of the association.

Chicago Traffic Matters.

CHICAGO, Dec. 2, 1896.

For some weeks past the Baltimore & Ohio has been carrying the lion's share of the eastbound traffic out of Chicago, more particularly the export business, and officers of other eastbound lines became suspicious; but Receiver Cowen, while in this city last week, publicly and strongly denied charges. He gives as one reason for the increase the differential rates that are allowed via Norfolk and Newport News.

The Grand Trunk has given notice to its western connections that it will join them in meeting Canadian Pacific competition in eastbound excursions from northwestern points to Eastern Canadian territory, but not to joint traffic points.

The Illinois Central has shortened the time of its "Daylight (Chicago-St. Louis) Special" to eight hours.

The pass agreement of the Western roads for 1897 provides that an application for a pass from a traffic officer of another road shall not be recognized. It must come from the President, the General Manager or the General Superintendent.

A conference of traffic officers representing the Western Freight Association, the Trans-Missouri Committee and the Southwestern Traffic Association is now in session in this city, considering the transit privileges in trans-Missouri grain shipments. The practice of reconsigning at the river at through rates has caused a great deal of trouble both to railroads and shippers. It is desired to make tariffs that will do away with any discriminations, but the prospect of success is poor.

Total eastbound shipments by lake last week, amounted to 64 492 tons, of which 58,336 tons were grain. The week before, the total was 85,246. All-rail shipments footed up 61,866 tons, compared with 65,640 tons for the preceding week, a decrease of 3,774 tons, and against 58,312 tons for the corresponding week of last year. The all rail traffic was carried by the different lines in the following proportions:

Roads.	Week to Nov. 28.		Week to Nov. 21.	
	Tons.	p. c.	Tons.	p. c.
Michigan Central	6,472	10 5	6,665	10.5
Wabash	5,086	8 2	4,836	7.5
L. S. & M. S.	7,321	11 8	9,700	14.8
Pitts., Ft. Wayne & Chicago	4,610	7.4	5,592	8.2
Pitts., Cin., Chi. & St. Louis	6,824	11.0	6,973	10.6
Baltimore & Ohio	7,795	12.6	9.095	13.1
Grand Trunk	6,289	10.2	6,834	10.8
N. Y. C. & St. L.	5,615	9.1	5,828	8.9
Erie	6,851	11.1	7,082	10 8
C., C., C. & St. Louis	5,003	8.1	3,035	4 8
Totals	61,866	100.0	65,640	100.0

Of the rail shipments 3,560 tons were flour, 34,025 tons grain, 8,119 tons provisions, 7,201 tons dressed beef. Lake business continues heavy on account of the prolonged open weather.